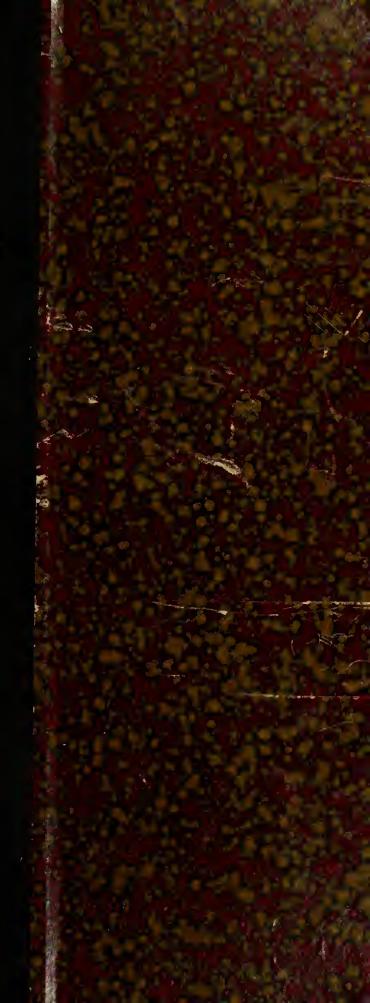
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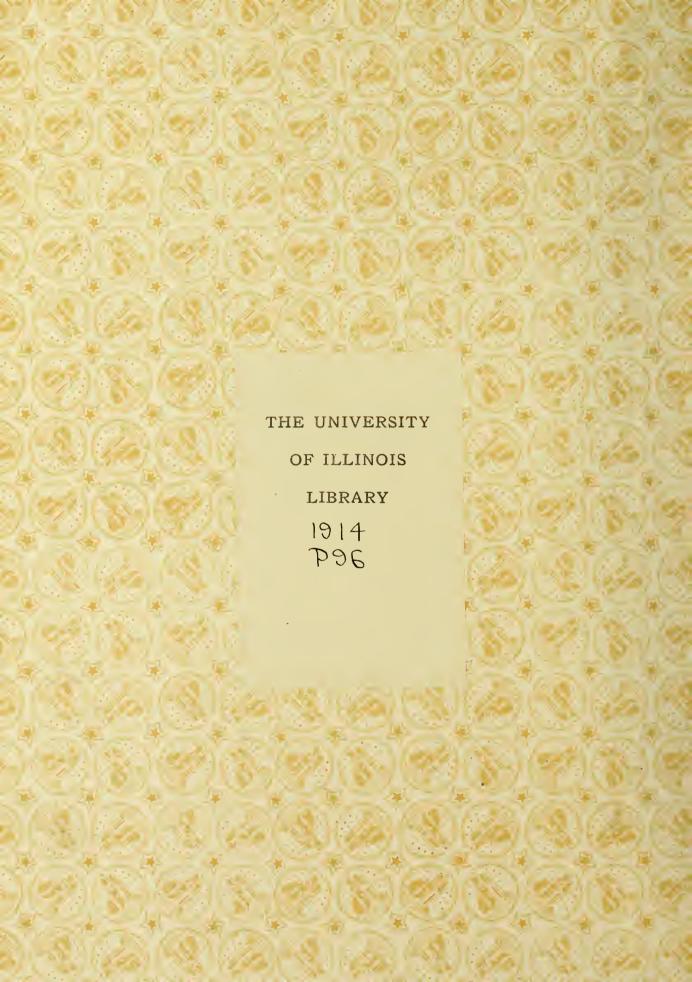
Prevention of Railway Accidents

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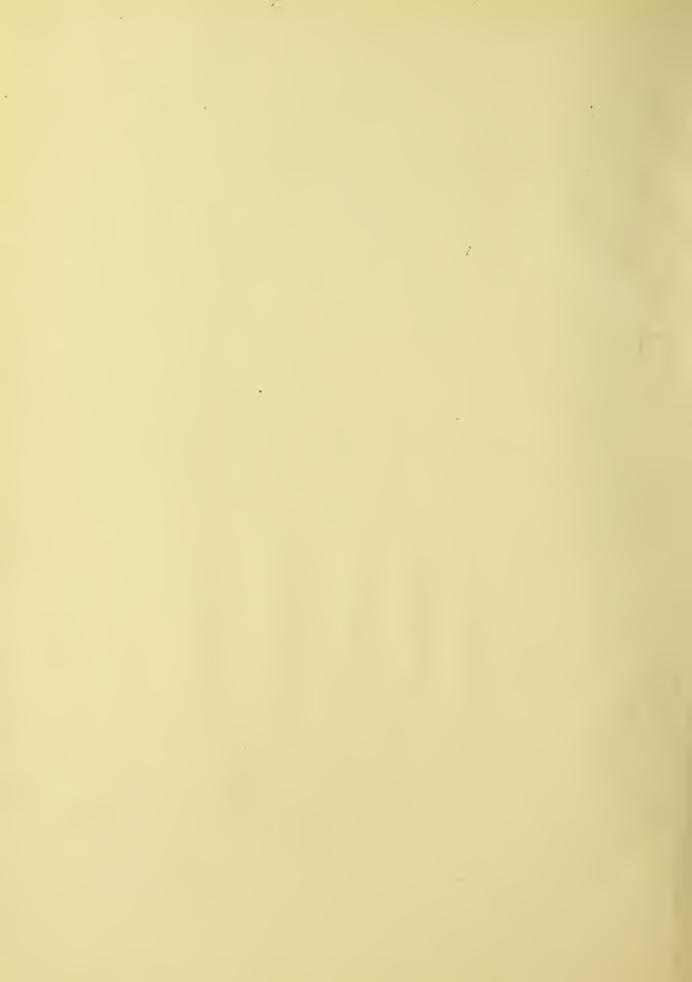
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1914









PREVENTION OF RAILWAY ACCIDENTS

BX

WILLIAM SING-CHONG PUNG

THESIS

FOR THE

DEGREE OF BACHELOR OF SCIENCE

IN

RAILWAY CIVIL ENGINEERING

COLLEGE OF ENGINEERING

UNIVERSITY OF ILLINOIS

1914

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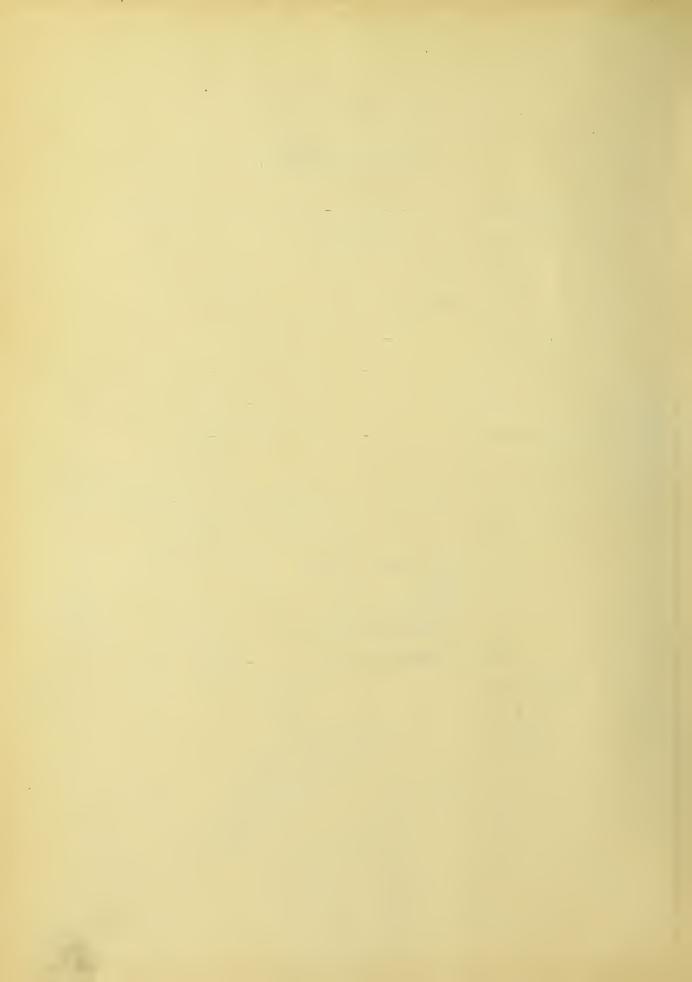
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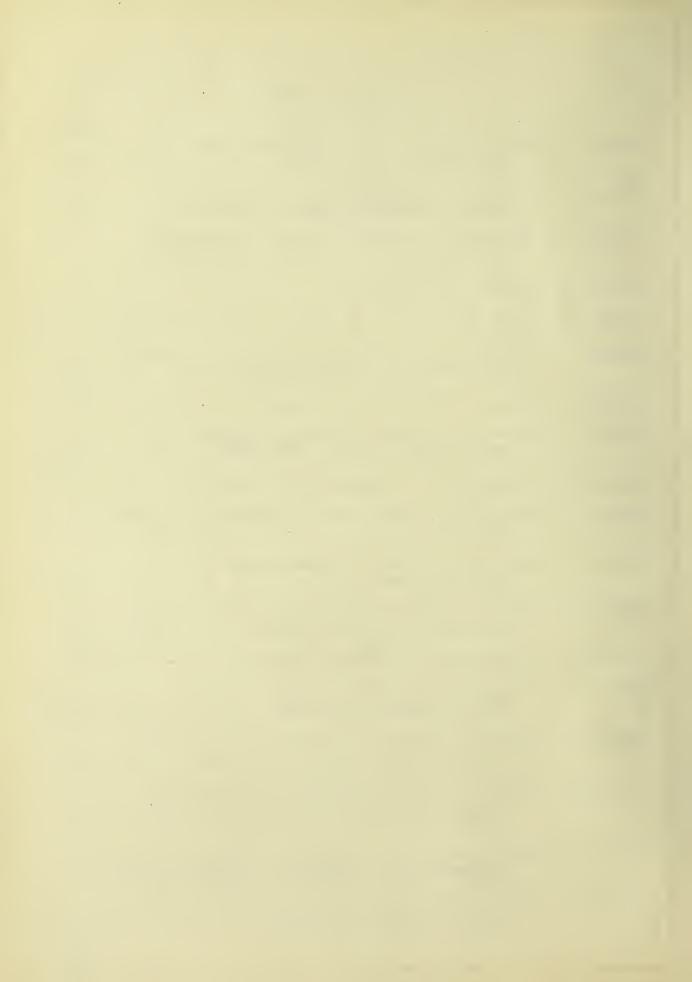
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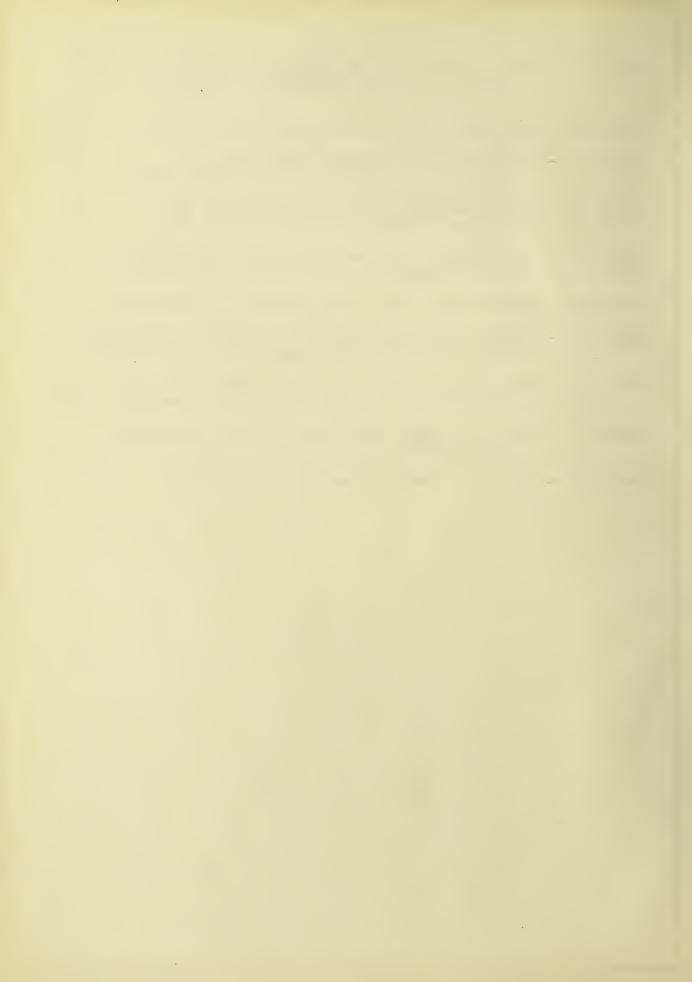


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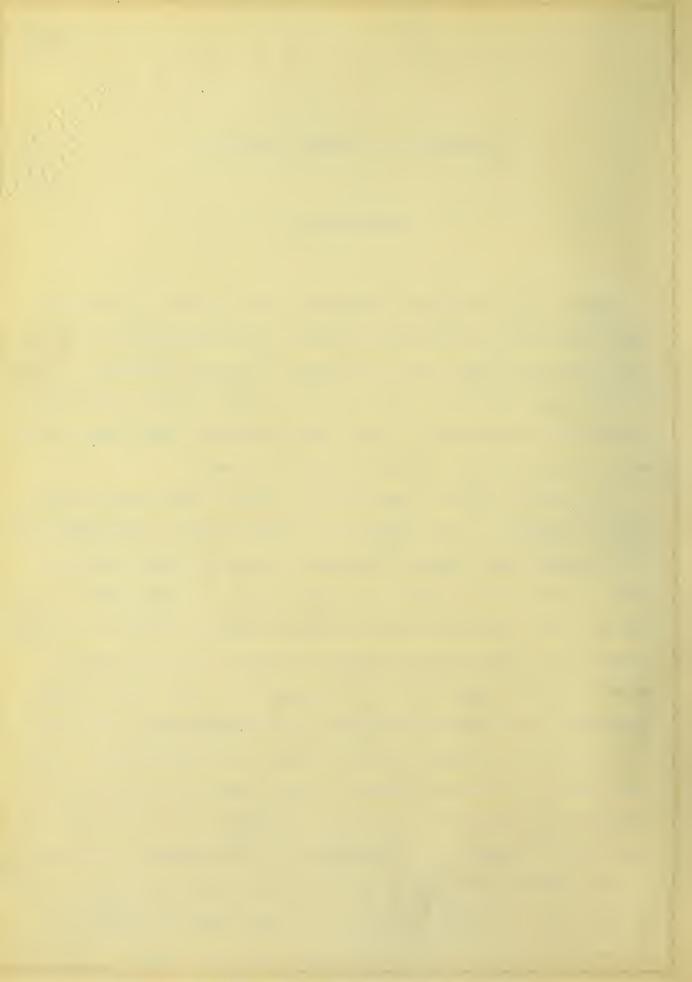
PREVENTION OF RAILWAY ACCIDENTS.

Introduction.

Next to the discussion of freight rates, there is perhaps no other problem of the American railway more discussed by the public and railway employees than the subject of railway accidents. The general discussion as to how to prevent these accidents has been going on for many years, in fact, ever since the great Angola railway accident of 1867, which took away 29 lives. 1

To show how serious the accident "disease" has become on the American railway, we may peruse the figures shown by the statistics of the Interstate Commerce Commission during the past twenty-five years, (from 1887 to 1912). In these reports we learn that 188,037 persons have been killed, and 1,395,618 persons injured on the railroads of the United States during that time. We are certainly appalled by the magnitude of such slaughter. These figures give an average of 7,853 persons killed, and 58,150 injured each year or a yearly total of nearly 66,000 persons killed and injured. means that for every day during the past twenty-five years 181 persons have been killed or injured -- nearly eight every hour, or one every six minutes. The death toll of the greatest revolution in the history of the world, the Chinese Revolution of 1911, with a total loss of 10,000 lives in four months would be placed in

Angola accident in New York--Dec. 18, 1867. Adam's.



an insignificant position before these figures of the destruction of human life in the peaceful operation of the American railroads.

Then again, the pneumonic plague which swept across Manchuria, China, in 1910 took away thousands of lives. This disease was pronounced by the most eminent doctors in the world as the most deadly disease that has visited the world since the "Black Death" in the 18th. century, which took away 25,000,000 lives. Yet with concerted action of the world's best doctors, this deadliest of all diseases was checked and wiped out in a few months. Now, why cannot the "Railroad Plague" in this country be checked? Is there no specialist competent to diagnose the symptoms of this dreadful disease? Is there no hope for a cure?

This a great problem, a pressing problem indeed. The public attention has been concentrated on the subject more and more, and the time seems ripe for drastic action. The same problem is confronting the people in the countries of Europe. A person in the United States may ask how serious is that problem in the European countries. The answer would be given by reference to the figures in the different countries of that Continent. The following figures give the number of fatalities on European railways. The average number of deaths, according to statistics from 1900 to 1910, was 62,443 or 6245 persons per year. This shows that 17 persons are killed every day on the European railways. In order to get a clearer conception of these figures we may bring out the statistics of two or three of the biggest railway countries in Europe. From the figures on accidents on British railways gathered by the Board of Trade for the years 1900--1910 inclusive, we have:



TABLE I.

Total casualties on British Railways for ten years,

Year	Killed	Injured
1910	1.121	30,110
1909	1,033	28,383
1908	1,128	28,485
1907	1,211	25,975
1906	1,252	20,444
1905	1,180	18,236
1904	1,158	18,802
1903	1,262	18,557
1902	1,171	17,814
1901	1.276	18,305
1900	1,325	19,573
	13,117	243,244

These statistics show that the number of persons killed on the British Railways in ten years is 13,117 and injured is 243,244. From these figures we deduce that 1,312 persons are killed and 243,24 are injured every year, or, in other words, there are 71 persons killed or injured every day on the British Railways.

According to the orficial statistics of railway accidents in Germany, the average number of killed is about 1200 annually, and the number of injured about 2200. For other countries like France and Russia the number of killed and injured is no less than that of Germany.

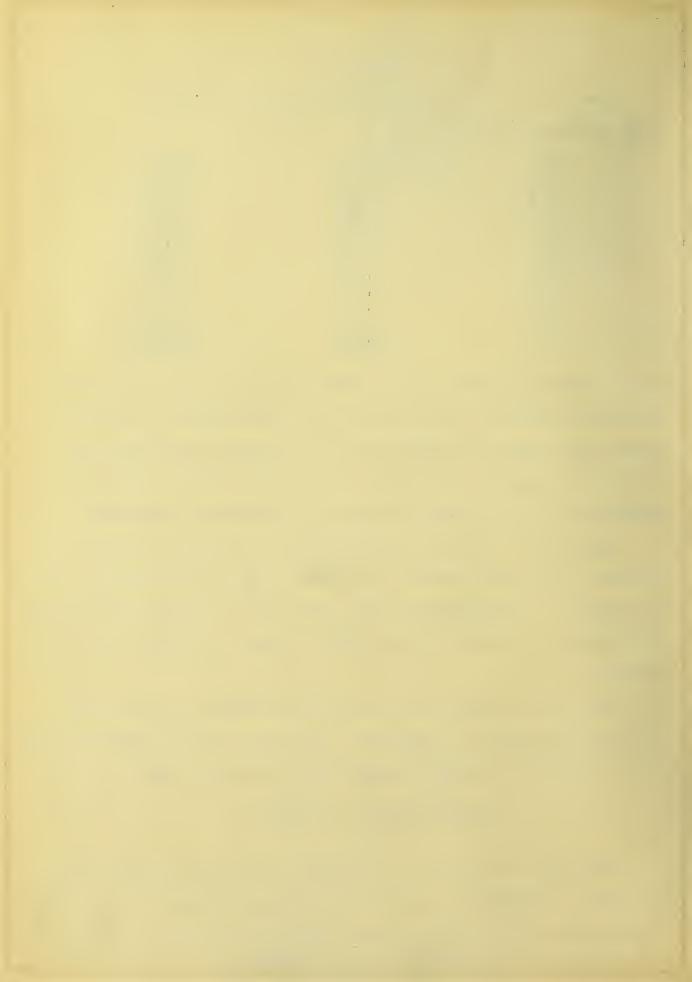
What are the causes of this appalling waste of human lives?

How can this waste be prevented? These are the two questions which
the writer will attempt to answer in the ensuing pages.

Classification of Accidents.

There are two classes of accidents, preventable and non-preventable. Preventable accidents may be subdivided into the following causes; by collision, spread-rails, soft tracks, bad ties,

1. Board of Trade Reports- British Railways.



irregular track, negligence of employees, and trespassing. All these are attributed to carelessness, human fallibility, false economy or failure to provide safe means on the part of the rail-way companies.

Non-preventable accidents are those created by defects of equipment, broken rails, unforeseen accidents like floods, earthquakes and landslides, and malicious obstruction of the track.

Responsibility in these cases cannot be placed upon anyone. From the statistics of the Interstate Commerce Commission the following table showing classification of accidents from 1905--1909, inclusive, is taken.

TABLE 2.

Summary of casualties in the movement of trains.

Average for five years, 1907 - 1911, inclusive.

	killed	injured
Collisions	675	8,356
Coupling and uncoupling	244	3,508
Parting of trains	21	543
Falling from trains,		
cars and locomotives	944	6,999
Struck by trains, cars		
and locomotives	6211	6,725
Overhead obstruction	80	979
Derailments	408	5,379
Locomotive or car		
breaking down	27	304
	9366	41,365

Collisions.

In the above table we see that train collision is the chief cause of accidents to passengers. It is probably the least excusable of all the classes of accidents. These are the accidents which generally fill the headlines of the newspapers throughout the country, and they are practically the only railway accidents



which the public at large notice. The number of passengers killed every year may seem to be an insignificant proportion of the number of passenger carried every year, yet this reasoning will never be a satisfactory explanation to the public. Such figures ought not to be satisfactory to the railways. The number of collisions in the five years from 1907--1911 was 30,266, killing 2,401 and injuring 37,407. The number of track and roadbed defects producing accidents in that same period was 6,285, killing 228 persons and injuring 7,673.

From a study of the causes of the accidents by collision and a study of the book of rules and regulations of the railways, we see that this class of accident is the least excusable of all. Nevertheless, we read almost every day in the newspapers that a certain collision has taken place, and all the horrible details of the catastrophe are graphically recited. During the period from 1907 to 1911 inclusive, the number of collisions and derailments as reported by the Interstate Commerce Commission was 61,806, of which 51% is collision. The amount of damage to cars, engines and roadway, and to the injured is about \$348,650,134; amount for clearing wrecks, \$37,795,432, 1900 to 1909 inclusive.



TABLE 3.

Payments on Account of "Loss and Damage" and "Injuries to Persons", and proportion to Gross Earnings, 1900 - 1910.

	Loss &	Damage		Injuries	
		Per cent	of		Per cent of
Year	Amount	Earnings		Amount	Earnings
1900	7,055,622	. 474		8,405,980	.565
1901	8,109,637	.510		9,014,144	.567
1902	11,034,686	.639		11,682,756	.676
1903	13,726,508	.722		14,052,123	.739
1904	17.002,602	.861		15,838,179	.802
1905	19,782,692	.946		16,034,727	.770
1906	21,086,219	.907		17,466,864	.751
1907	25,796,083	.996		21,462,504	.829
1908	34,631,243	1.447		20,088,543	.839
1909	32,922,986	1.386		23,456,038	.988
Increase	in				
11 years	338%	139%		178%	52%

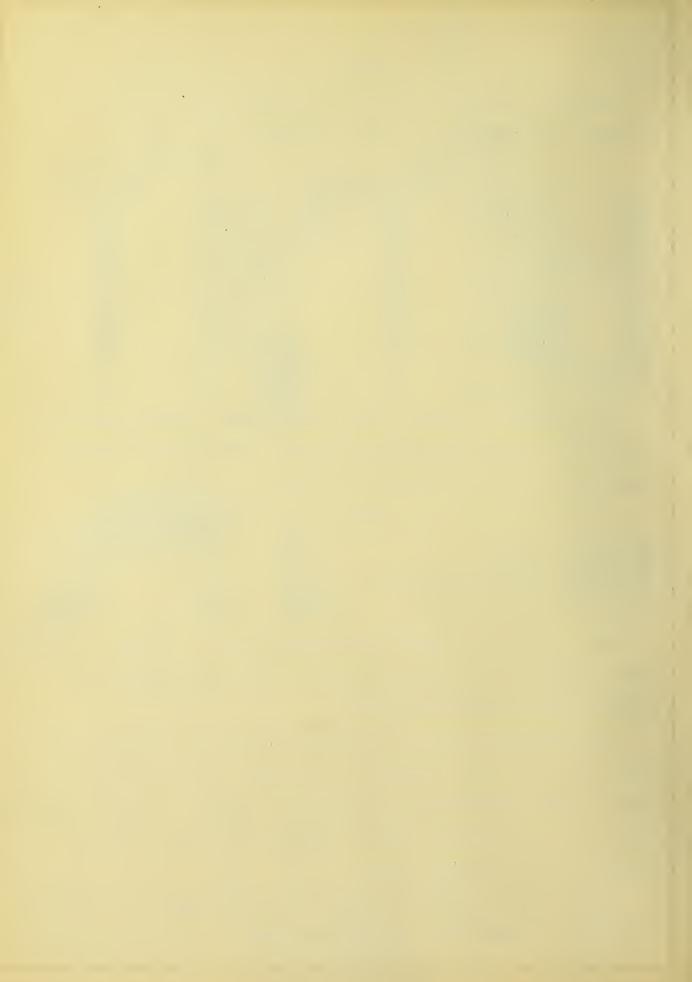
Collisions are divided into four different classes; rear-end collisions, butting or headon collisions, collisions by trains separating and miscellaneous collisions.

TAB	LE 4.		
	No.	Killed	Injured
Collisionsrear	6,583	632	9,571
Collisions butting	3,649	1,177	14,254
Collisions trains separating	2,305	35	1,055
Collisions miscellaneous	15,666	657	13,168
	28,203	2.501	38.048

Not counting the "Miscellaneous Collisions" as shown in the above table, we see that the rear-end collisions comprise the greatest percentage of accidents.

The principal causes of these collisions are, failure to observe and obey signal indication, excessive speed in trying to make up time, intoxication of enginemen, mistakes of block operators long hours of service, improper flagging, failures of block system, and other human errors.

In the case of disobediences of rules and orders, the question arises as to whom should receive the blame. Is it the superinten-

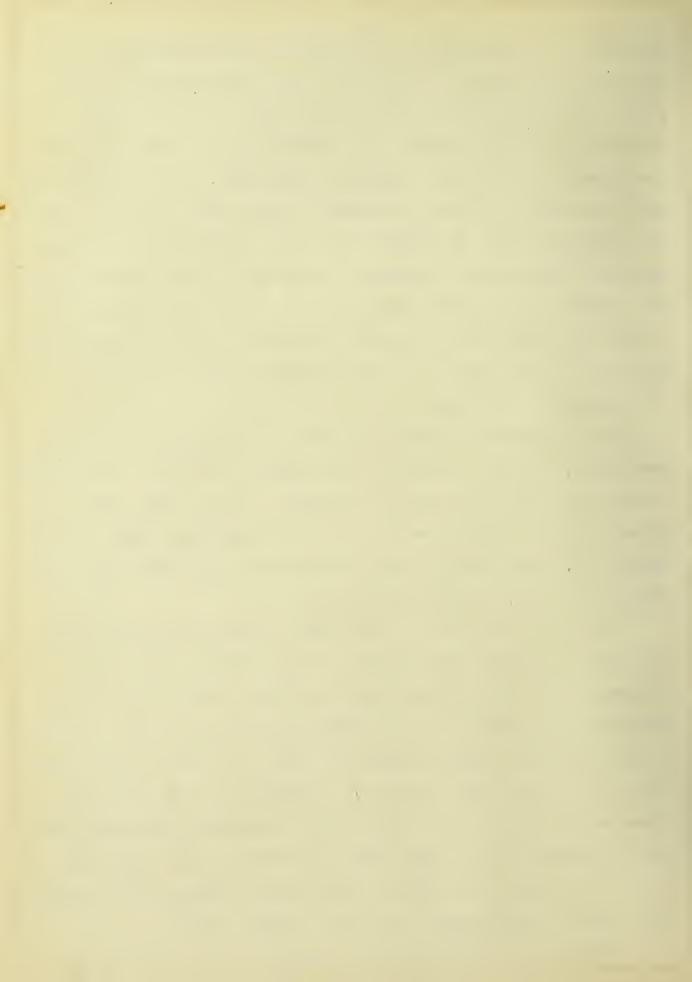


dent? Is it the dispatcher, the operators, or the enginemen? All of these three classes of men are of vital importance in the operation of trains. They are the ones who bear most of the burden of responsibility for accidents. We also know that no cars are moved from terminal to terminal except by locomotives, and the man who pilots the engine, therefore, preforms the most vital function. Yet the conductor cannot be subordinate to the engineman in train organization. His position is almost as important as the engineman's. The superintendent's duties are to see that the enginemen are fitted to run the locomotive according to the book of rules and regulations and that the conductors are properly supplied with information about the movements of trains.

From the figures of the 1912 report of the Interstate Commerce Commission, we learn that 40% of the accidents are due to the fault of the train crew other than the brakemen. Of this 40%, 12% is placed against disobedience of rules and regulations; 23%, excessive speed; 16%, carelessness; 13%, misread orders, and 12% running past signals, and 10%, forgetfullness.

The report also shows that 19.3% of the accidents are due to the fault of dispatchers and operators and 10% are due to errors of brakemen. From these percentages of accidents we may judge of the weakness of the human element in American railroading. The bulletins of the Interstate Commerce Commission show that errors in the operation of the train order system are frequent and fatal, and that these errors are all of the same sort. Dispatchers give wrong orders, operators fail to copy orders correctly or have forgotten to deliver the orders that should be delivered; conductors and enginemen misread, misinterpret, overlook or forget orders.

During a series of years the reports of the Commission on



"Prominent collisions" have established the fact that 17% of them occur between passenger trains, 32% between passenger and freight trains and 51% between freight trains. The same reports go to show that the fatalities from the same collisions are distributed in the proportion of 26%, 38%, 36%, respectively. Freight trains figured in 62% of the total collisions and passenger trains 38%, whereas the fatalities from these collisions were divided in the proportion of 55% and 45% respectively.

In the 1903 accident bulletins the Commission found some reasons for of agitating fer the compulsory use of the block system. They found that the train order system of operating trains was the cause of most of the accidents. In the same year the Commission recommended legislation compelling the use of the block system and submitted a bill requiring the use of the block system on all interstate lines within a certain period. Such a bill was introduced in Congress in 1905, but up to the present time no definite action has been taken on it.

Another cause which has been made prominent by the accident bulletins in relation to collisions was the long hours of service to which train employes were subjected. Many accidents which were reported were ascribed to excessive periods of service. If the events were to be traced to their first cause, it would have appeared that many of the reported cases of misreading, overlooking or forgetting orders were also due to the fact that wits were dulled and senses benumbed by lack of rest.

When these facts were brought before the Congress it took immediate steps in getting a law passed on March 4, 1910, limiting the hours of labor of trainmen and telegraph operators. Since the



passage of this law, it is not possible to estimate the resulting decrease in accidents, since the new "safety first" movement has been presented to the railroad employes and public during the same period.

It is an interesting fact that no road can claim immunity from these accidents, as they occur on the best equipped and best managed roads. There are a few roads, however, which have exceptional records The Southern Pacific, for example has not an accident or the loss of a single life for the past 5 years. The Delaware, Lackawanna & Western R.R., aside from the Coning accident in July, 1912, has had only two persons killed for a period of 12 years, during which time 250,000,000 passengers were carried. Then again, on the Burlington, aside from the Western Springsaccident on July 14, 1912, there was not a bad accident for 22 years.

Table 5 shows the number of killed and injured according to the grouping of the Interstate Commerce Commission for the years 1900-1909, inclusive.

TABLE 5.

Number of persons killed and injured in collisions in the different Groups for years 1900--1909, inclusive.

Group III III IV V VI VIII VIII IX X Total,10	Killed 241 1,264 995 349 690 968 316 618 147 360 5,948	Injured 2,748 13,331 10,737 4,129 7,613 10,385 1,971 7,471 2,509 3,437	Year 1909 1908 1907 1906 1905 1904 1903 1902 1901 1900	Killed 357 453 859 658 688 692 734 677 451 377	Injured 5,184 7,120 9,724 8,233 7,533 7,479 6,852 5,550 3,732 2,924
years	5,948	64,331		5,948	64,331

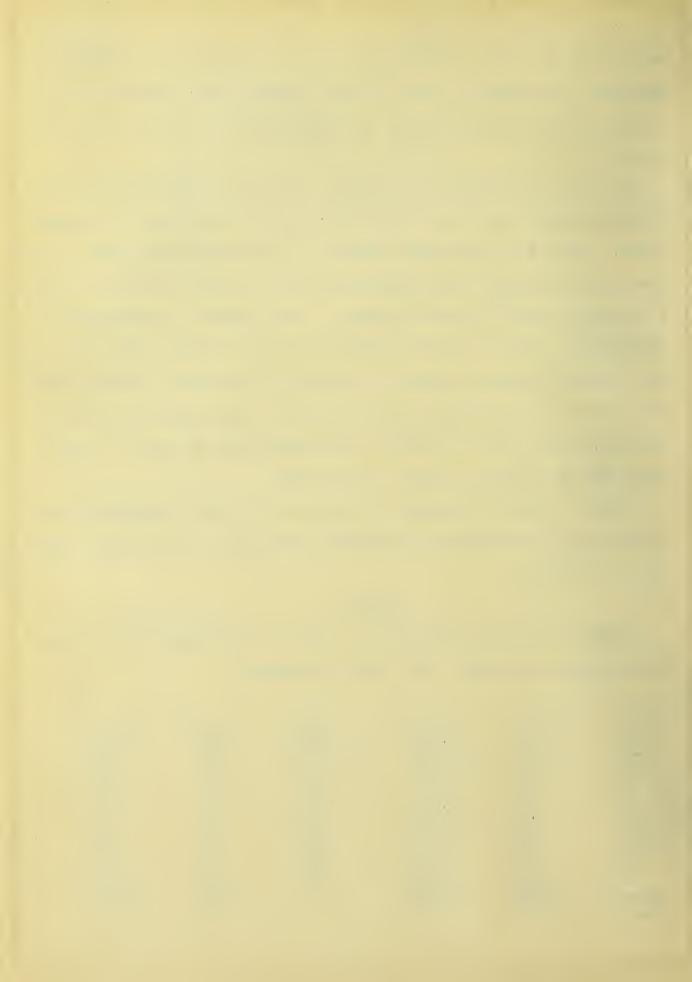


Table 6.

Summary showing population and Railway mileage of the American Groups and European Countries.

	United	States Miles of	Europe	Miles of
Division	Population	Railway	Population	Railway
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII	6,552,681 21,145,629 9,985,342 7,004,418 11,771,641 14,445,528 2,225,609 7,947,263	8,121 23,815 26,172 13,996 27,976 51,830 13,935 33,987	21,756,000 45,450,971 34,565,198 15,768,797 7,868,000 105,269,000 64,387,984 30,402,000 119,193,000	13,766 23,286 10,439 3,456 10,438 52,863 41,277 17,458 35,156
IX & X	10,892,056 91,972,137	41,028 240,831	119,193,000 444,660,940	35,156 208,139

Table 5 shown that Groups II, III and VI have the greatest number of victims from collisions. Part of these collisions of course may have occured on highway crossings. In table 6 we observe that in Group II, there is a population of 21,145,629. This is the most densely populated division of all the groups, yet the number killed in collisions, average for the ten years (1900-1909, inclusive) is 126, and the average number of injured is 1333. In Groups III and VI the population is 9,985,342 and 14,445,528, respectively and the number of killed averaged for the ten years (1900-1909, inclusive) is 99 and 96 respectively. The number of injured are 1073 and 1038 respectively.

But if we take into consideration the train mileage, the amount of traffic and density of population of the groups in question, the per cent of killed and injured are much smaller than in the other groups. This is due to the better road-beds, and more fully equiped block signal systems in the railroads of these groups.



TABLE 7.

Number of Employes by Groups and per 100 miles of Line.

1909

Group	No. of Employes	Per 100 miles of line
I	79,316	992
II	353,613 215,462	1,480 828
IV V	68,141 129,506	494 471
VI	272,985	529 471
VIII	58,489 158,192	475
IX	72,074 95,045	407 449

Again, Table 7 shows that these Groups have a considerably greater number of employes than the other Groups.

Derailments.

The accidents which are caused by derailments may be either preventable or non-preventable. This class of accidents produces 13.1% of all the deaths and 7.7% of the total injured, according to Table 2.

The derailments are usually caused by broken rails, defects of equipment, malicious obstructions on tracks, high speed, poor roadbeds, curves, etc. In a number of derailments investigated by the Interstate Commerce Commission, it was found that track conditions were unsafe for the movement of trains at even ordinary speed, and yet no adequate measure had been taken by those in authority to insure speed reduction orders. Defective road-bed is not confined to the less prominent roads where no special effort is made to run trains at phenomenal speed, but has also been found on the more prominent roads in connection with the most widely advertised high speed trains in the country.



Broken rails have played quite a part in the derailments of trains.

Investigations of derailments due to broken rails have developed the fact that current specifications for the manufacture of rails are not adequate to guard against the most common type of fractures.

A great many of the derailments are caused by high speed around curves. Could such accidents be avoided in any way? This seems to be a hard question to answer without careful tests and experiments. However, according to a statement made by the late A.M. Wellington, he said, "If we could eliminate all curvature from railways we might perhaps decrease by 25 to 50% the danger of life and property. But this is practically impossible."

Signal Failures.

Signal failures are divided into two classes, failure of machines and failure of operators. Signal failures have proven to be quite serious, as is evidenced by the fact that something like 19.3 per cent of all collisions are due to this cause.

Trespassers.

Now, leaving the other minor causes of preventable accidents, we come to the subject of accidents caused by trespassing on rail-road property. According to the figures as given in the I.C.C. reports for the 20 year period, 1890-1909 inclusive, fatalities to trespassers constituted 53.09 per cent of all the fatal accidents on the railways of the United States, and constitute about 8% of the total number of persons injured. Of the 163,171 persons killed 86,733 were trespassers.

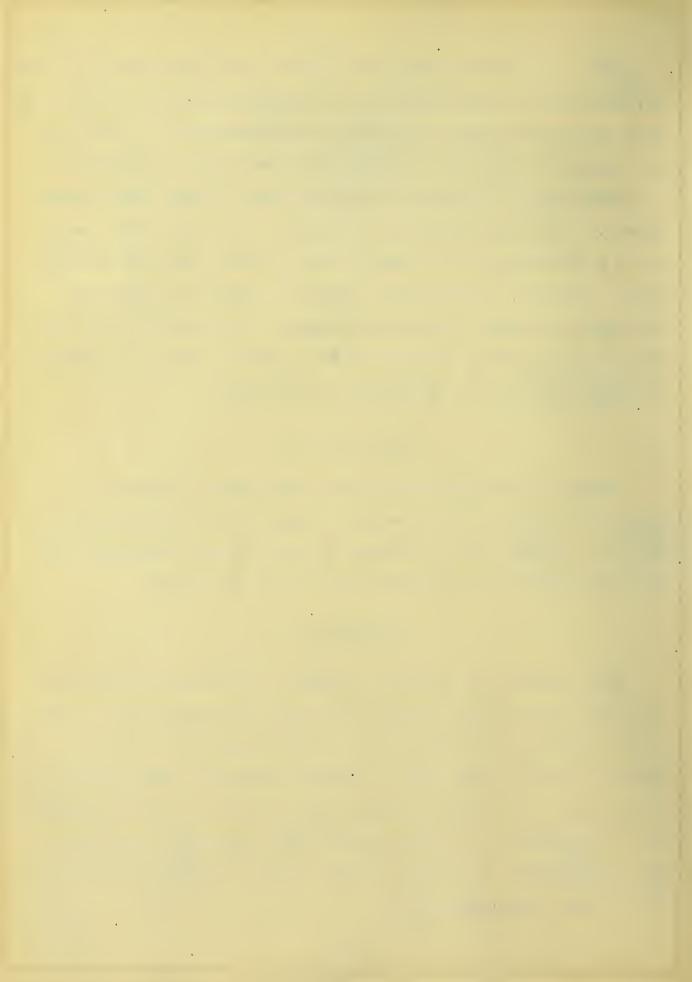


TABLE 8.

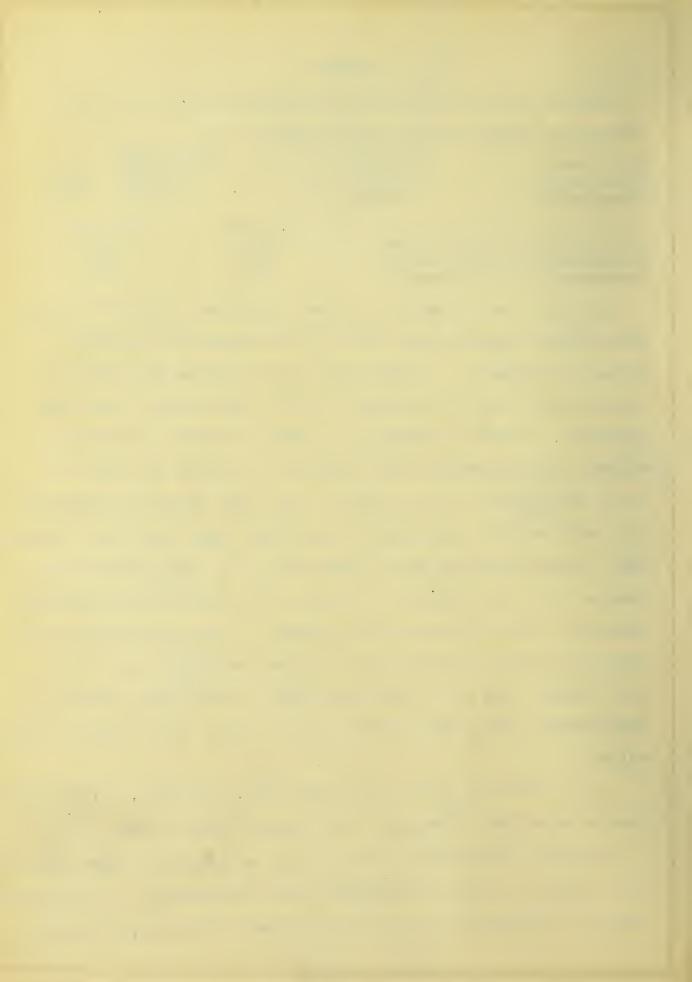
Persons killed and Injured in Railroad Accident during the

twenty year period	18901909 inclusive.		
	No. Killed	No. Injured	
All classes	163,171	1,190,125	
Other persons	101,629	142,040	11%
Trespassers	86,733	94,646	66%

	Per cent	Per cent
Other persons to all classes	62.2	11.9
Trespassers to other persons	85.3	66.7
Trespassers to all classes	53.9	7.9

of what class of people do these trespassers consist? It has been commonly assumed that most of the trespassers killed are tramps or "hoboes". A tramp means one who walks from place to place, either idly or in search of work; specifically, "an idle wanderer". "Hobo" is defined as an idle, shiftless, wandering workman. Investigations have brought out the fact that most of these trespassers are not tramps. Mrs. Alice Willard Solenberger, in a book recently published by the Russel Sage Foundation, Entitled "One Thousand Homeless Men", stated that, "to class these men as tramps is not only unfair to the men, but confuses the discussion regarding either homeless men or tramps". From investigation she found that 200 out of 1000, or less than twenty-five per cent, were tramps. The I.C.C statistics give the following division of trespassers: 25% of trespassers are car riders, while 75% are track walkers.

In the ten year period from 1900--1909, inclusive, 58,781 other persons other than passengers and employees were killed, 49,741 of these were trespassers. In the same period 86,817 other persons were injured of which number 52,870 were trespassers. Of the 49,741 deaths to trespassers during this ten year period, 33,267 were



caused by moving trains, locomotives or cars at points along the track. The extremely fatal nature of this class of accidents is indicated by the fact that while more than 33,000 persons were killed, little more than 18,000 were injured, the deaths exceeding the injuries in a ratio of 1.83 to 1.

A thorough study of the occupations of persons killed on the New York Central Line by Frank V. Whiting, General Claims Attorney, New York Central Lines. in March 1912, shows the following:

TABLE 9.

Occupations of persons killed on New York Central Lines.

349 unknown

19 none

70 school children and students

268 laborers

44 farmhands

l minister

1 actor

10 engineers

1 chemist

4 clerks

6 hotelmen and bartenders

2 coachmen and chauffeurs

18 merchats, salemen 4 lumbermen

and agents 3 linemen

3 cigarmakers

3 nurserymen

81 shopmen and mechanics

2 barbers

1 contractor

3 bakers

2 messengers

5 soldiers

8 sailors

l inmate of asylum 31 railway trainmen and other

employees

3 musicians

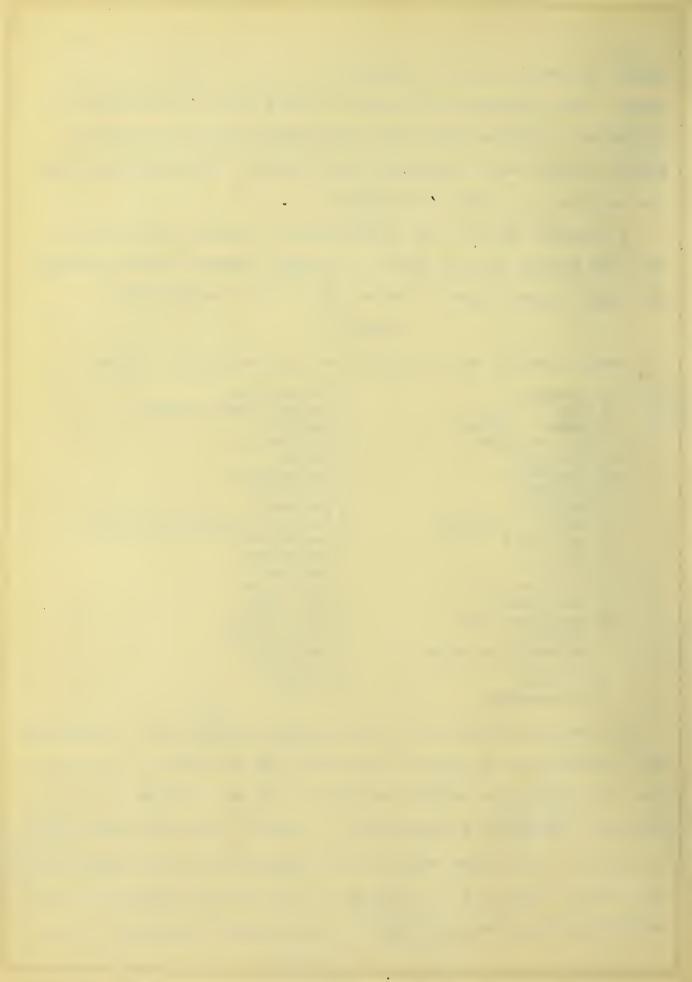
1 teacher

2 fishermen
1 patrolman
2 shoemakers
4 horsedealers

3 watchmen

8 miners

Mr. Whiting found that of 1000 persons killed while trespassing, 489 resided near the place of accident; 321 resided at a place distant from where the accident occurred; and the residence of the balance, 190, was not ascertained. Another thing that indicates clearly that the large majority of trespassers are not tramps in any sense of the word, is that 598 of the thousand referred to were self-supporting (388 were known to be regularly employed), and 105



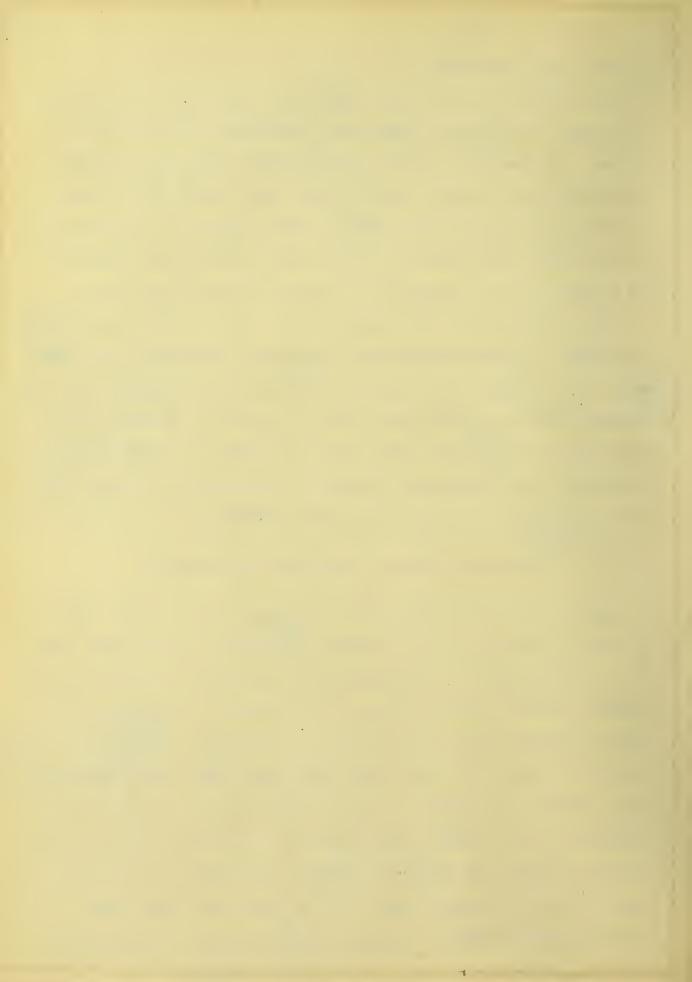
were not self-supporting.

With reference to nationalities, etc. the report by Mr. Whiting, showed that 468 were Americans, including 3 Indians and 18 negroes. In the 174 cases the nationalities were not reported, but in the rest it showed that no less than twenty-four foreign countries contributed their quota to this regiment of trespassers. It was further found by Mr. Whiting, that 746 were not "hoboes" and 50 were, while the status of the rest was not determined.

Who is responsible for these deaths? Many people have charged this class of accidents against the railway managements, and indicated that if they would properly police and fence their tracks and eliminate grade crossings the situation would be improved. Rail-way officers have replied that the real trouble is that there are to few laws and ordinances relating to trespassing on railway property and that those there are are not enforced.

Trespassing Due to Inefficient Government.

Inefficient government is said by some to be the sole cause of the 5,200 deaths on the railway right-of-way every year. One of the main purposes of governments is to protect citizens in their property rights. Railway owners are citizens; for many legal purposes the corporations are citizens. Therefore, the property of railways is entitled to the same protection from intrusion as any other property. In order to protect the property of citizens the government levies taxes. In proportion to the value of their properties railways are among the largest tax-payers. The average annual amount of railway taxes for the five years 1905-1909, inclusive, was 78,600,000. Surely railway property is entitled to



the same measure of protection by the police as other property.

The facts show that practically no effort is made by public police officers to keep trespassers off railway property.

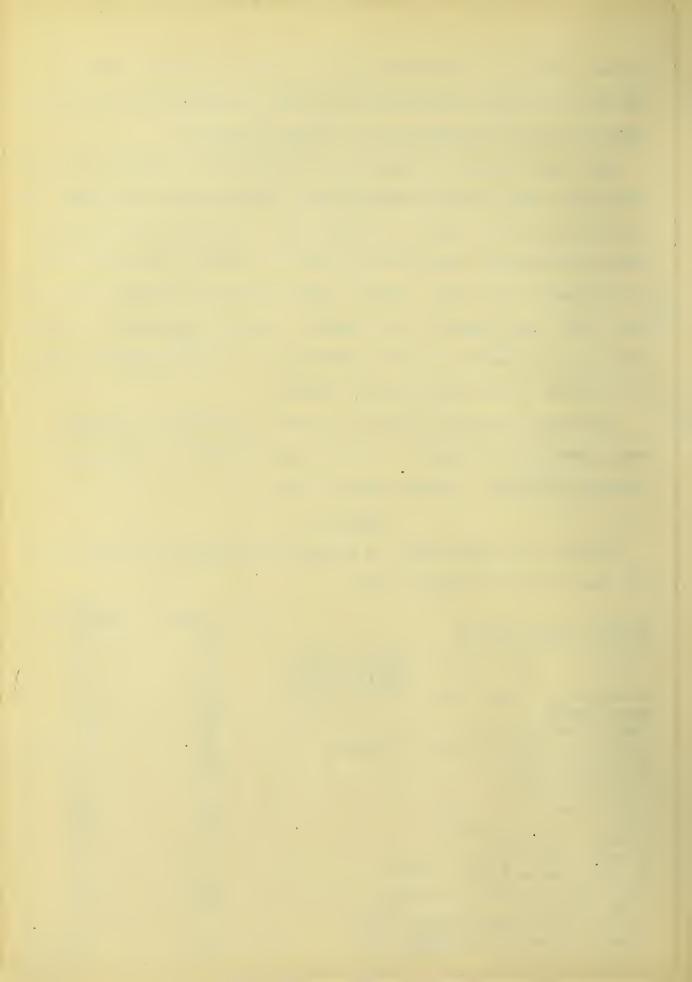
Are the trespassers citizens of the country? If they are, the government should protect their lives and limbs from the wheels of the moving trains. But it is shown that the government, national, state and municipal, makes little effort to protect lives and limbs of citizens in this way. Of the 4,785 arrests in Chicago and elsewhere only 2,183 received punishments, and in many cases the punishments were so slight that they could have little tendency to deter the offender from repeating his offense.

The following table shows the number of arrests of railway trespassers and the number of punishments reported in Chicago for the month of June, July and August 1912.

TABLE 10.

Arrests and Punishments of Railway Trespassers in Chicago during June, July, and August, 1912.

		No.
	No. Arrests	Punishments
Chicago Great Western	121	78
Actchison, Topeka & S. F. Coast Lines	95	26
" " Western Lines	111	43
" " " Eastern Lines	41	35
Pennsylvania Lines West of Pittsburgh	422	234
Grand Trunk	240	129
Rock Island Lines	38	37
Baltimore & Ohio, Chicago Terminal	302	30
Baltimore & Ohio	1465	816
Northern Pacific	33	19
Michigan Central	25	23
Lake Shore	152	94
Chicago & North Western	131	34
Chicago and Alton	96	64
Chicago, Burlington & Quincy	93	39
Indiana Harbor Belt	18	9
New York, Chicago, St. Louis	473	227
Erie Railroad	726	215
Chicago & Western Indiana & The		
Belt Railway of Chicago	174	28
Chicago Junction	29	283



Of a total number of 4,785 arrested, 2,183 were punished.1

Table 10 shows that the situation in Chicago is very disheartening. It is not much better in other parts of the country. It is generally understood that public officials of cities and towns are usually very reluctant to arrest or punish railway trespassers.

The facts may be made more clear by giving a detailed statement of the Erie Railroad showing the diligence with which the railway police enforce the laws of trespassing, and the lack of co-operation of the civil authorities in prosecuting the offenders.

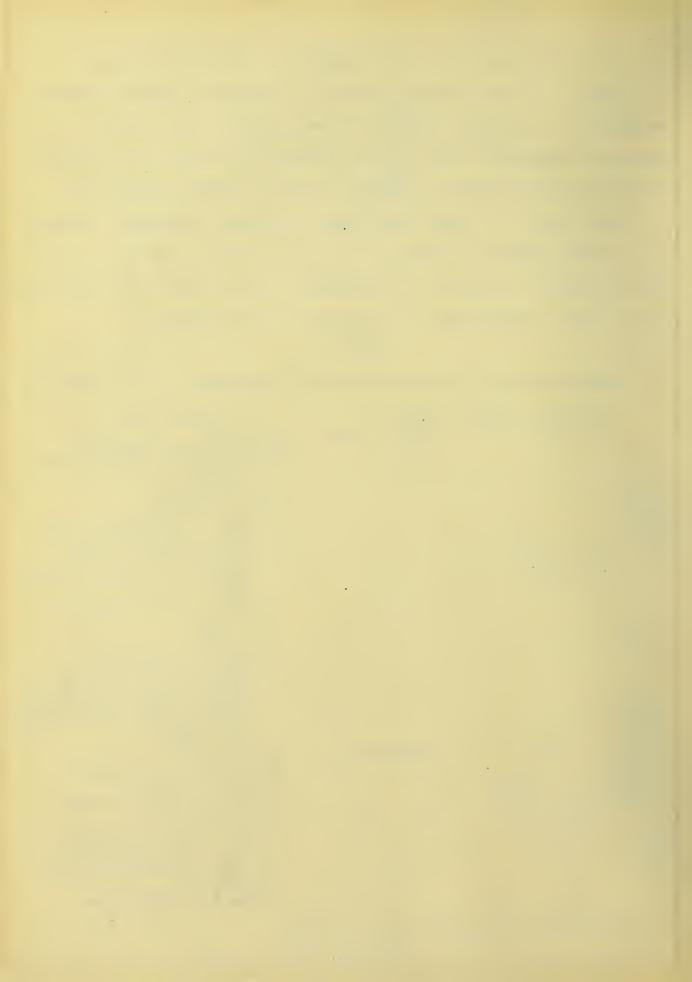
TABLE 11.

Showing arrests and punishments of trespassers on Erie Railroad.

Number arrested	Cause		Disposition
530	Train-riding	57	fined
		219	sentence suspended
			bought tickets and were
	•		released
		71	discharged
		68	sent to jail
		2	sent to detention home
		31	ordered out of town
		2	ordered out of town on
			account of lock-up being
			full
		3	hard labor on streets,
			5 days
			paroleâ
			sent to workhouse
		1	turned over to charity,
			society, ran away and was
			caught train riding again
			and turned over to juven
120	trespassing	21	ile court fined
120	orechassing		
		22	sentence suspended sent to jail
			ordered out of town
			discharged
			sent home to parents
		2	sent to reformatory
		ĩ	
			paroled parents
		3	
Railway Age Gaz	ette- Dec. 20, 1	912.	
11 "			

Dec. 20, 1912.

(2)



No. arrested	Cause		Disposition
		2	put in charge of probation officer
22		5	sentence suspended turned over to juvenile officer fined
4	Trespassing and breaking into gum machine	4	discharged
4	Trespassing and breaking off lock on tool house		paroled sent to parents
1	Trespassing and meddling with R.R. property	1	held for grand jury- \$500.00 bail
2	Trespassing and cutting air hose	2	held for action of grand jury
9	Trespassing and vagrancy		sentence suspended sent to jail
. 14	Trespassing and coal theft	5	fined paroled turned over to probation officer. turned over to juvenile court
2	Trespassing and theft of iron	2	paroled
4	Vagrancy		sent to jail sentence suspended
8	Violating track elevation ordinance		fined discharged
6	Begging at Station	2	discharged sent to work-house ordered out of town
M - 4 - 7	200		

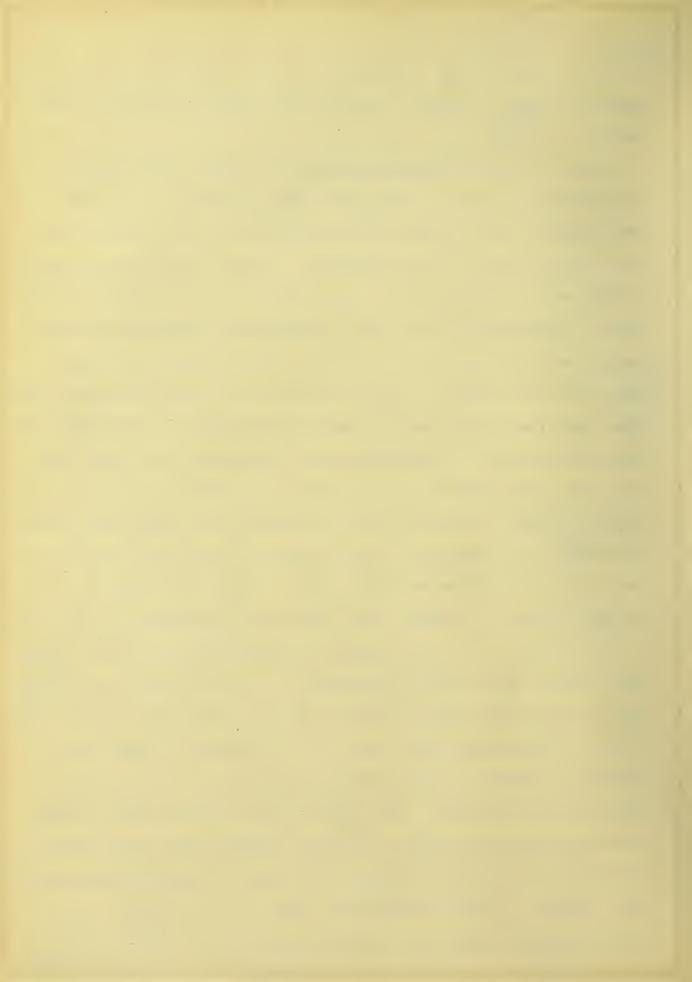
Total arrested 726--total punished 215.



The record further shows that the majority of the trespassing cases are those of minors, which is also true on almost all the roads.

Are the railroads doing anything to prevent this chronic slaughtering? They are doing everything possible to prevent trespassing, but they lack the co-operation of the state, city and town officials in this movement. Without such co-operation little can be accomplished. An official of the Michigan Central said:- "On account of the petty depredations committed by these tramps we are compelled to use every effort possible to keep them from the trains. I find in visiting the towns along the line that very few of them have a rock-pile on which to work prisoners who are arrested for misdemeanors or trespassing, nor have they any arrangement whereby the prisoner can be made to work out his fine. In these towns it cannot be expected that they will punish prisoners for trespassing. As the rule all over the line we cannot do much but drive away the tramp or boy who attempts to ride on our trains or interfere with the work of switchmen in the yards!

An officer of the Lake Shore & Michigan Southern says: - "When-ever tramps, hard looking characters, or train riders are encountered in our yards they are driven off, and frequently placed under arrest. There are points, where it is useless to arrest trespassers on account of the authorities refusing to take action against such offenders. The reason given in most cases is that the municipalities do not care to be burdened with the expense of lodging vagrants and tramps, and action is seldom taken against them unless it is ascertained that they are able to pay a fine, in which case a small fine is generally imposed. Our policing of

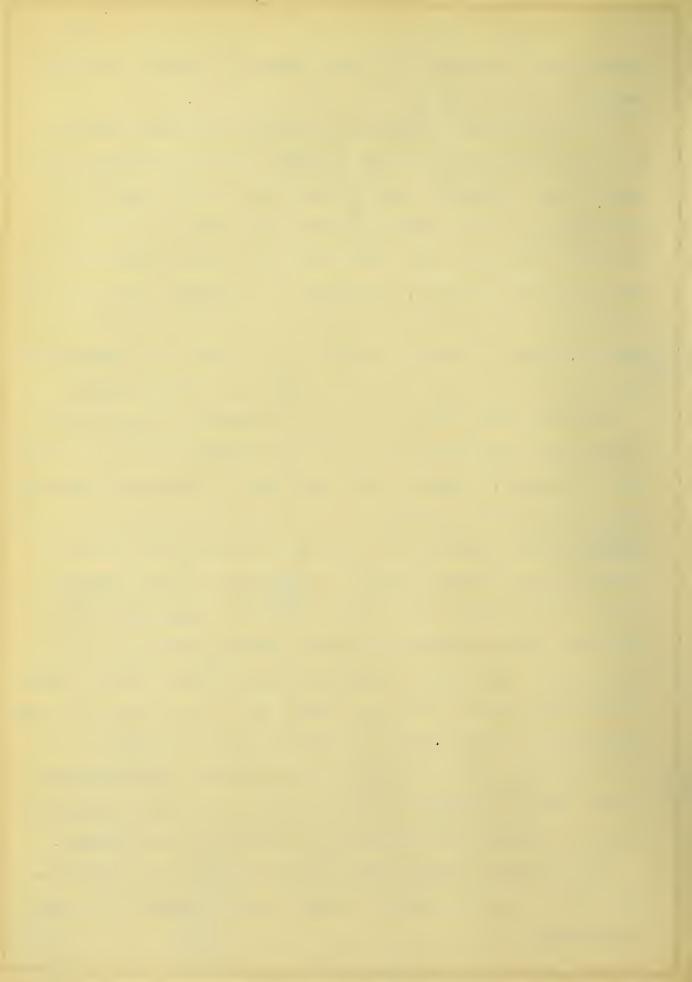


large yards is constant, and train riders are arrested wherever results can be obtained.

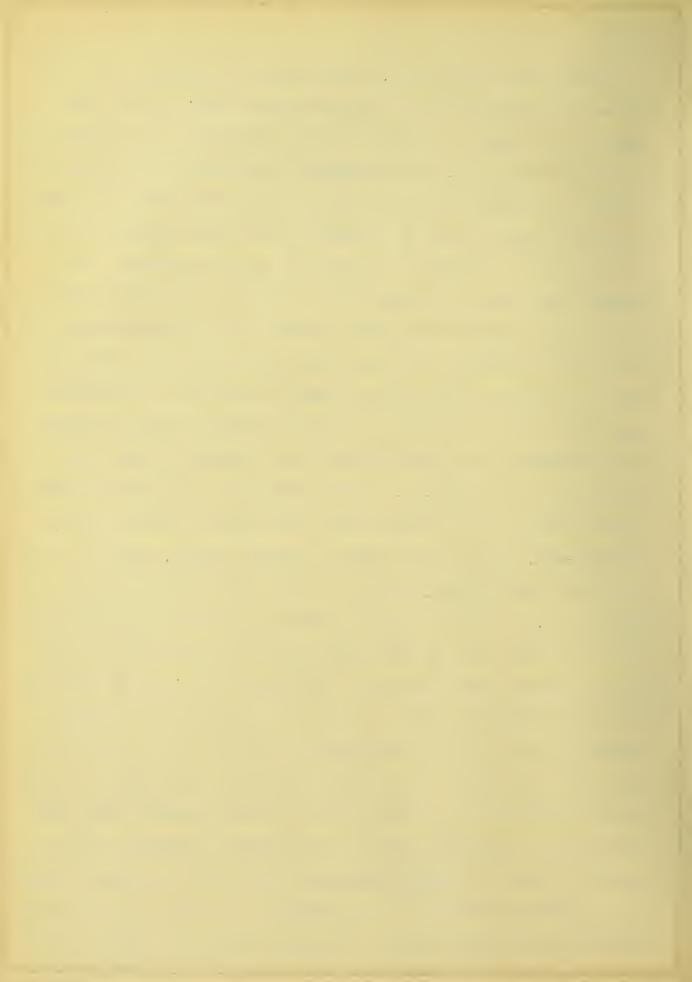
"We have special constables in our most important terminals to prevent trespassing as well as theft. Trainmen protect their trains from trespassers, and we also employ special agents for investigating thefts, frauds and assisting generally in the protection of property, etc. More assistance from prosecuting attorneys and police justices, particularly in Michigan, in convicting trespassers, would result in a gratifying reduction in the tramp element, which is a serious menace; and the need is a trespassers' act framed sufficiently drastic to insure its effectiveness."

From the facts given in the above quotations we may be convinced that the railways are really and earnestly trying to check the trespassers. However, this continuance of chronic trespassing and of this chronic slaughtering are due to the fact that in most states and municipalities the laws do not specifically prohibit trespassing on railway property, or that they are not enforced. In some states there are statutes prohibiting tampering with switches, placing obstructions on the tracks, stealing rides on trains, etc., but there is usually no statute specifically prohibiting trespassing in any form. Only a few of the states have laws specifically directed against trespassing on railway tracks and these laws are usually mild in form and not very often enforced. A great deal of difficulty has been experienced from time to time in getting magistrates to prosecute offenders in this respect.

The following summary shows the provisions of all the states that can be found that deal with the specific subject of railway trespassing.



In New York all persons, except railroad employees, are prohibited from walking upon or along railway tracks, except where they are laid across or along streets or highways. In Wisconsin it prohibits trespassing, but no penalty is provided for violating the statute. In Virginia persons are prohibited from being on a track within one hundred yards of an approaching train otherwise than in passing over the railway at a public or private crossing. In Missouri any person is injured while walking on a railway track without right cannot bring action against the railway company, but the courts in Missouri have nullified this statute and there is really no specific prohibition of mere trespassing. In Indiana any person found trespassing on railway property shall be guilty of a misdemeanor and on conviction shall forfeit not less than \$5.00 nor more than \$50.00. In New Hampshire it is provided that "if any person shall without right enter upon or remain in any right-of-way, track, yard, station, ground, bridge, depot or other building of any railway when notice has been posted forbiding such trespassing, he may be fined not exceeding \$20.00, and no right to enter or be upon any railroad track shall be implied from custom or use, however long continued." In Maine it is provided that no railroad corporation shall be liable for the death of a person walking or being on its road contrary to the law or to its valid rules and regulation. It is further provided that whoever without right trespasses on a railway track or other property shall forfeit not less than \$5.00 nor more than \$20.00. Railways are required to keep the section containing this latter provision posted in a conspicuous place in every passenger station, and for neglect thereof may be fined \$100.00. The New Jersey law prohibits any



person but an employee from walking along tracks except when they are laid on a public highway; and any person who is injured while violating this provision cannot recover damages. Massachusetts provides that whoever without right knowingly stands or walks on a railroad track shall forfeit not less than \$5.00 no more than \$50.00 Rhode Island law is similar to that of Massachusetts.

and had proved to be satisfactory, other states would surely have followed their foot-steps. But the laws already existing are not enforced as the conditions demand. During the past few years numerous legislatures have passed laws regulating hours of service of railway employees, fixing the number of men in train crews, requiring high power headlights, etc. All of these provisions only prevent but a very small per cent of railway accidents.

The two following questions seem to be pertinent:

(1) Is a National law prohibiting trespassing on railway property necessary? (2) Has Congress the power to pass such a law?

Table 12 shows that about 5,000 people are killed and another 5,000 are injured annually while trespassing upon American railways. If this enormous waste can be appreciably reduced by more drastic laws, the need for such laws is plainly evident.



TABLE 12.

Number of Trespassers killed Railway Property. 1

United States.

Year	Killed	Injured
1909	4,939	5,759
1908	5,489	5,756
1907	5,612	5,512
1906	5,381	5,927
1905	4,865	5,251
1904	5,105	5,194
1903	5,000	5,079
1902	4,403	4,854
1901	4,601	4,858
1900	4,346	4,680
Total	49,741	52,870

per year Average for the 10 years --- 4,974 killed, -- 5,287 injured.

TABLE 13.

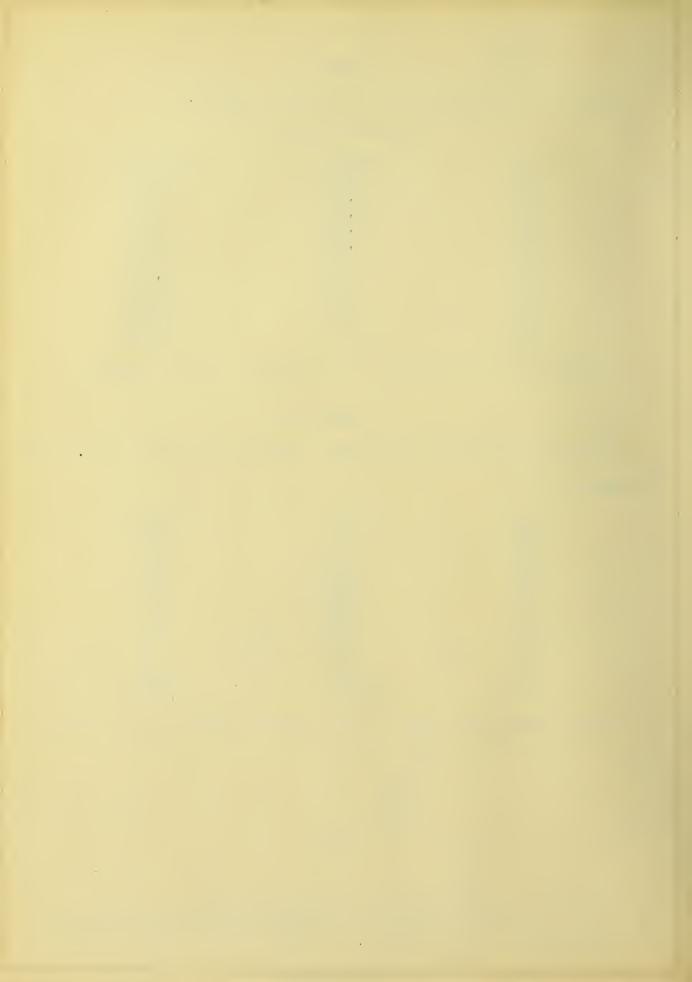
Trespassers on English Railways. (Number of persons other than passengers). 2

Year	Killed	Injured
1897	255	142
1898	276	147
1899	313	139
1900	288	154
1901	282	154
1902	286	116
1903	279	135
1904	285	120
1905	263	96
1906	274	92
Total	2,801	1,295

Average for per year for the 10 years -- 280 killed, -- 129 injured.

Statistics of Railways in the United States. (1) (2)

General Report by Board of Trade upon accidents of the Railways of the United Kingdom. (Latest figures that could be obtained).



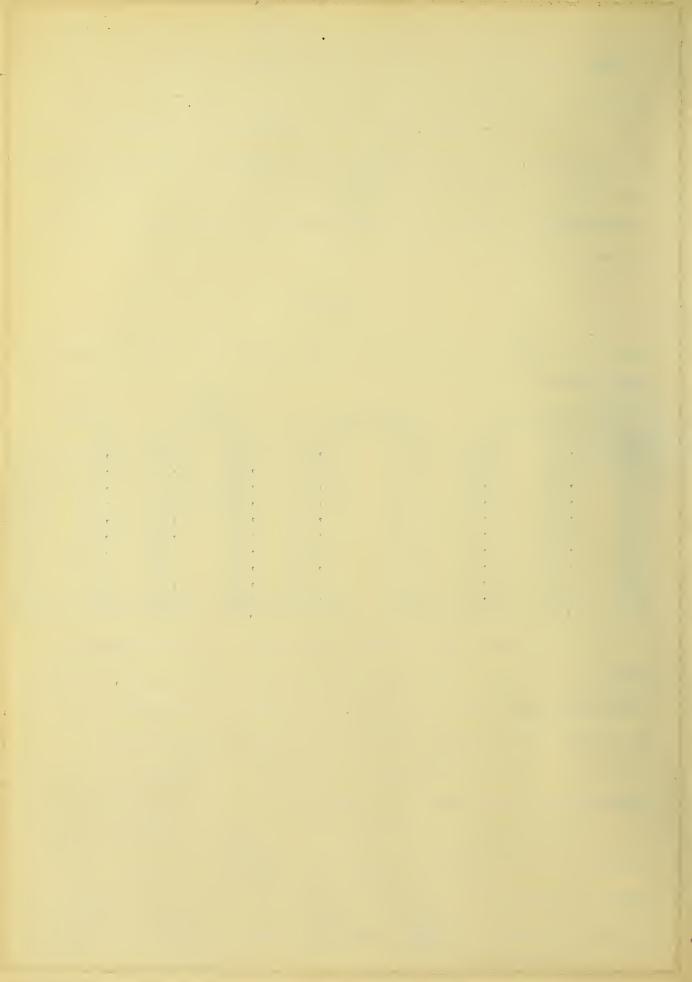
From table 12 we see that fourteen people were killed yester-day while trespassing; fourteen will be killed to-day; fourteen will be killed to-morrow, and still nothing has been done to check the slaughter. It is not often that as many as fourteen passengers are killed in a wreck; but every bad wreck is given a thorough investigation, often resulting in orders by commissions or legislation.

TABLE 14.

Summary of Railway Accidents for ten years ending June 30, 1909-1900. United States. 1

1000	0.02		6ther					
	Emplo	yees	Passe	engers	per	csons	Tota	.1
Year	Killed	Injured	Killed	Injured	Killed	Injured	K.	I.
1909	2,610	75,006	253	10,311	5,859	10,309	8,722	95,626
1908	3,405	82,487	381	11,556	6,402	10,187	10,188	104230
1907	4,534	87,644	610	13,041	6,695	10,331	11,839	111,016
1906	3,929	76,701	359	10,764	6,330	10,241	10,618	97,706
1905	3,361	66,833	537	10,457	5,805	8,718	9,703	86,008
1904	3,032	67,067	441	9,111	5,973	7,977	10,046	84,155
1903	3,606	60,481	35 5	8,231	5,879	7,841	9,840	76,553
1902	2,969	50,524	345	6,683	5,274	7,455	8,588	64,662
1901	2,675	41,142	282	4,988	5,598	7,209	8,455	53,339
1900	2,550	39,643		4,128				50,320
Total	32,671	647,528	3,812	89,270	58,781	86,817	95,864	823,615

Table 14 shows that the greatest number of passengers ever killed in a single year from all causes was 610 in 1907, and in that year according to table 12, the number of trespassers killed was 5,612. This gives a ratio of nine trespassers killed to one passenger. And yet newspapers throughout the country are agitated commissions issue orders, and lawmakers legislate to reduce accidents to passengers, while almost no one in a position of public authority does anything to reduce the number of victims in the army of trespassers. During the ten years from 1900-1909 the number of employees killed was 32,671, and the number of tres-(1) I.C.C. Reports.

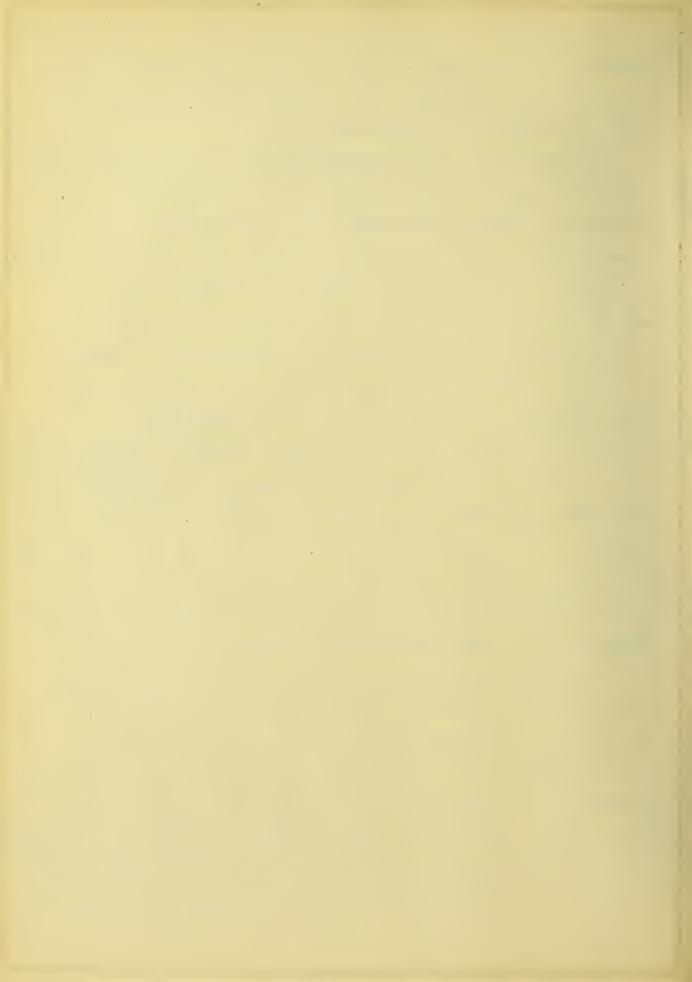


passers killed was 49,741. And yet, with these figures right before the eyes of the lawmakers, they do almost nothing to stop the killing of the regiment of trespassers.

Is trespassing as bad in Great Britain as in the United States? From the figures as given in Table 13 we can emphatically say, No. The average number of trespassers killed per year for the ten year period from 1897-1906 inclusive is only 280, and the average number of injured is about 130. The per cent of killed is only 0.06% and the per cent of injured is only 0.05% of the United States. This is certainly an exceedingly big difference in the number of killed and injured between the two countries. Why is it that there are so few trespassers killed in Great Britain?

It is due wholly to a strict uniform trespassing law which was passed by Parliament, through the influence of the Board of Trade. The strict enforcement of the law by the police, with the co-operation of the courts of the cities, and towns have made the number of deaths so small. This small percentage of deaths also shows that the people in the British Isles are good law-abiding people. They enforce the laws them-selves by obeying them.

It has been suggested that a national law regarding trespassing would be more forceful if passed by Congress. However, there is a doubt of the authority of Congress in the premises. If it has the power it must be derived from the constitutional provision empowering it to regulate interstate commerce. There are some doubts of the validity of a federal trespassing law; others question if it would be desirable, while still others believe that it would be a constitutional and wholesome regulation of interstate commerce.



According to the concensus of legal opinion the state should take the first step in the making of a trespassing law. The power of the state in this matter is unquestionable and it is left entirely in the hands of the state legislators to act. A very short and simple statute, if properly enforced, would be adequate. Such a statute should make it unlawful for any person, except an employee, to enter upon any railway right-of-way, and would provide for fines or imprisonment, or both, for every offense. If all the states would adopt adequate and uniform trespass laws, the evil could be eliminated within six months or a year. It is apparent, however, that uniformity of such a law could be better obtained by Federal legislation.

Highway Grade Crossings.

The accidents which are caused by grade crossings have redeived much public attention. There is hardly a municipality
of any size which has not at some time agitated the question of
abolishing railway grade crossings. The agitation is sometimes,
if not often, used for political reasons, but not infrequently
it is brought about by the desire for municipal improvement and
the removal of a constant source of danger.

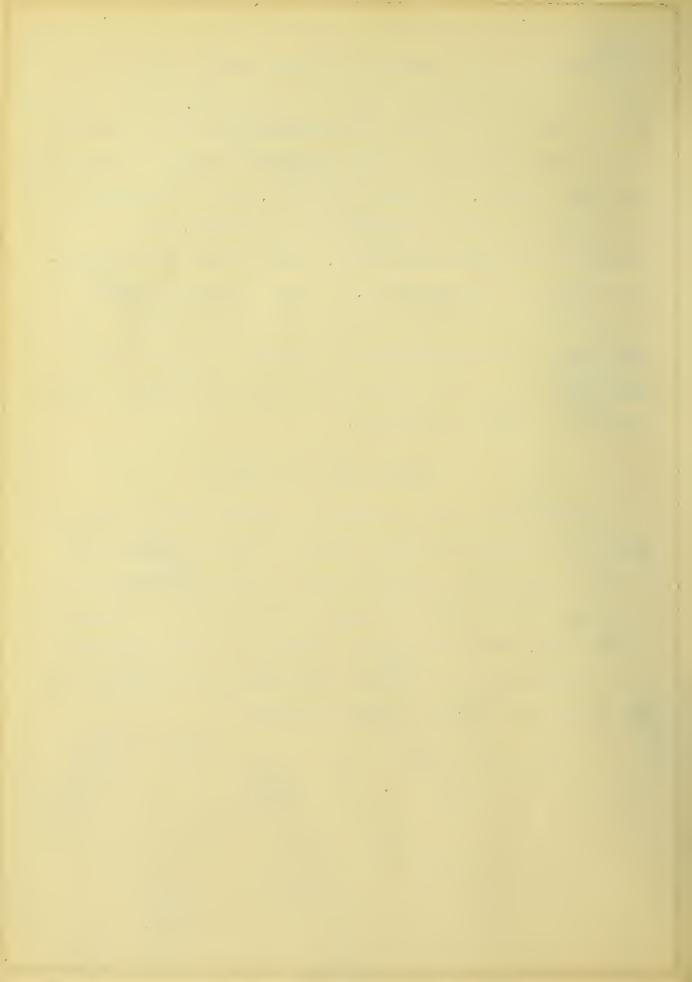


TABLE 15.

Persons killed and Injured in Highway Grade Crossings by Groups 1900--1909.

Passengers and others (Trespassing and Non-trespassing). Average for one year Injured Group No. Killed No. Injured Killed 55 475 549 44 I 411 4,118 244 II 2,438 394 214 3.945 III 2,142 57 570 26 IV 260 49 89 V 490 890 2,740 164 274 VI 1.640 270 11 27 110 VII 112 1,128 41 VIII 404 74 742 14 143 IX 293 682 29 68 X 836 1.561 Total 8,395 15,634

The grade crossing danger was not often foreseen in the early days of railway construction, but to-day the manager or president of the railway company would be only too glad to have every grade crossing on his road eliminated. However, there is always some disagreement in abolishing grade crossings between the railroads and municipalities over the question of finance. The municipal authorities expect too much of the railroad companies. They often want the railroads to pay all the expenses incurred in such undertakings. But these difficulties have been largely overcome in recent years by state laws and special acts of legislation, and agreements between the railroads and municipal authorities.

It is desirable that all possible precaution should be taken for the prevention of accidents at highway crossings, even though, as shown in Table 15 the highway crossing casualties are only one-fourth as many as the casualties occurring at other points along the track. In the ten year period, 1900--1909, inclusive, as shown in Table 15, 8,333 persons were killed at highway crossings.



as compared with 33,267 persons killed at other points along the track; 15,634 persons were injured at highway crossings as compared with 18,281 injured at other points along the track. Of the persons killed at highway crossings 6,198 were non-trespassers and 2,135 were trespassers; of the persons killed at other points along the track, 33,267 were trespassers, while only 780 were non-trespassers. Of the persons injured at highway crossings, 13,241 were non-trespassers and 2,479 were trespassers; of those injured at other points along the track 18,281 were trespassers and only 1,594 were non-trespassers.

TABLE 16.

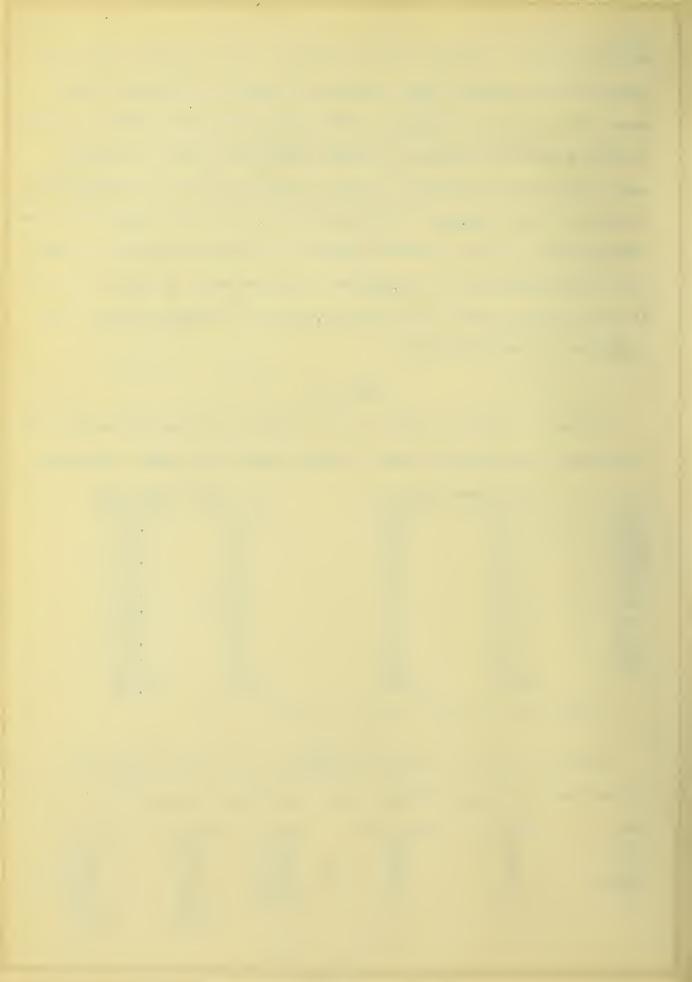
Number of persons killed and injured at Highway Crossings of Railways of the United States, during years 1900-1909, inclusive.

	Tres	passing	Non-t	respassing
Year	Killed	Injured	Killed	Injured
1909	112	211	621	1,619
1908	216	323	616	1,432
1907	237	274	696	1,523
1906	250	226	676	1,658
1905	215	256	622	1,308
1904	197	224	607	1,229
1903	271	247	624	1,227
1902	265	272	559	1,054
1901	201	242	619	1,101
1900	171	204	558	1,090
	2,135	2,479	6,198	13,241

Total killed 8,333, injured 15,720.

TABLE 17.
Number of persons killed and injured at Highway Crossings
of Railways of Great Britain during 1897-1906, inclusive.

Year 1906 1905 1904 1903	Killed 76 57 67 73 57	Injured 24 37 28 39 22	Year 1901 1900 1899 1898 1897	Killed 55 63 60 64 80	Injured 26 35 22 27 25
				652	285



Even with the eliminating of grade crossings there is still a tendency for the people to trespass on railroad property. Evidently railway right-of-way is regarded as a public park or highway. A striking example of this is in the city of Chicago.

The city of Chicago has passed an ordinance compelling the railways to eliminate all grade crossings and the railways, in compliance to this ordinance have spent about \$70,000,000 on track elevation, and expect ultimately to spend a total of \$150,000,000.

Yet, trespassing on their elevated track and right-of-way goes on daily, in spite of the fact that there is a specific ordinance prohibiting such trespassing. Whenever a trespasser is caught and arraigned before the judges of the municipal court, he generally gets a reprimand and is released to try it again. The following table shows the disposition of the cases by the municipal court of Chicago:

1	Arrested	Punished
Pennsylvania Lines West of Pittsb	urgh 172	32
Chicago and Alton	15	None
Chicago, Burlington & Quincy	52	7
Chicago & North Western	100	28
	339	67

These figures cover only for the months of June, July, and August 1912.

Table 18, following, taken from Engineering News of April 1st, 1909, shows what has been accomplished in the different states in the elimination of grade crossings.

From Table 18, it appears that the states which are eliminating grade crossings are the ones which are most densely populated.

Table 15 shows that Groups II, III and VI have the greatest number of victims from accidents. Group II consists mostly of the (1) Railway Age Gazette, Dec. 20, 1912.



TABLE 18.

Status of Grade Crossing Elimination in different States of the United States in 1909.

Alabama -- No elimination, except city of Birmingham.

Arkansas-No legislation, up to the Railways.

California -- No data.

Colorado -- No data.

Florida -- No data.

Georgia -- No data.

Indiana -- Legislation, but no action taken.

Iowa -- No legislation, overhead crossings 275, undergrade crossings 476.

Kansas -- No state action or Board order.

Maine -- No data.

Louisiana -- Action by commission, but no elimination.

Missouri -- No legislation.

Nebraska -- None.

North Dakota, Ohio -- no reports, Oklahoma -- none, Oregon -- no records;

Pennsylvania -- no data.

South Carolina, -- none.

Rhode Island -- None.

Washington -- None.

Connecticut -- 1889 -- 1908, 232 eliminations out of total 1, 193.

Illinois -- Only in Chicago and Joliet -- Railway 100%.

Massachusetts--1890-general grade-crossing law. 1890--1907-165.

Michigan -- A number of eliminations.

Minnesota -- No legislation, but left in settlement by cities.

Over and under grade crossings 162

Grade crossings -- 396.

Nevada -- 1 grade crossings.

Montana -- 2 grade crossings.

New Hampshire -- Done by railways when practicable.

New York--Grade crossing law of 1897, amended to 1906.

Elimination: - 1897-1908--220.

June the 30, unprotected crossings 6,793 protected 1906.

Over and under

grade crossings 1,644

10.377

Expense .- Ordinary, railroad 50%. city 25%, state 25%; where railway crosses existing street, railway, 100%. Where new street or road crosses existing railway, 50% City 50%.

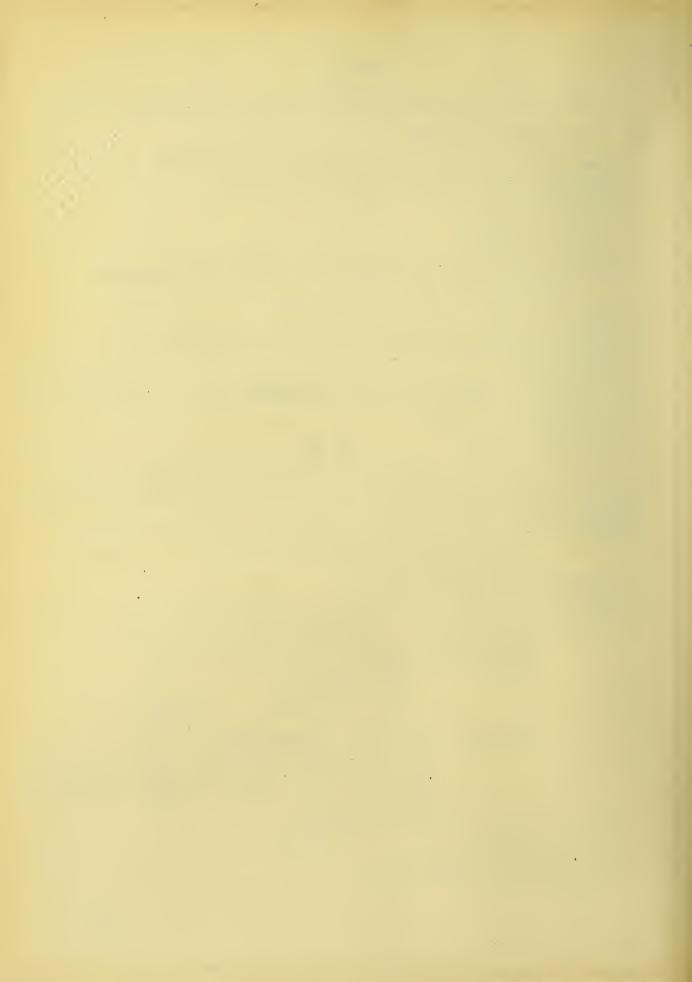
North Carolina -- Few eliminations.

Texas -- Very few.

Vermont--23 crossings.

Virginia -- S. & W. Rwy. all.

Wisconsin -- Some.



States of New York and Pennsylvania. From Table 18, we can see how much New York had done to-wards the elimination of the grade crossings. For Pennsylvania we have the following data:

Philadelphia, Pa.--1888-1908--all grade crossings, Pa. R.R.

1898-1909--All grade crossings, Phil. &
Trenton R.R.

1894-1908--over 17 grade crossings P. & R.Rwy.

1904--Three at No. Penn. Set. R.R.R.

1901--Four in Germantown, P. & R. Rwy.

Negotiations now under way will abolish all grade crossings and

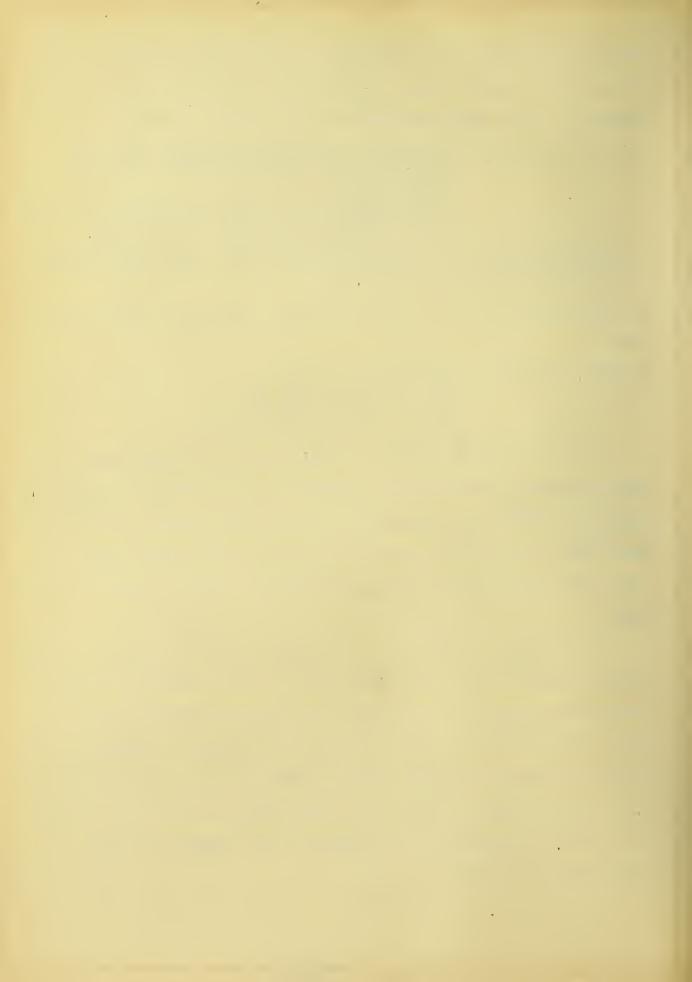
Negotiations now under way will abolish all grade crossings and fix distribution of expenses for each case. For this purpose city has appropriated \$1,000,000.

In Group III and VI, the City of Chicago shows the following work done.

Chicago, Illinois.--Eliminations---553
Future elimination--678
Miles elevated 681.29
Miles to be elevated 872.91

With the enormous amount of money which is being spent in grade crossing elimination to protect the lives of the people, the number of deaths still is about the same every year. This is because the people will not obey the laws and will still take the signs "Keep Off, Danger", as an invitation to take a chance on their lives.

On the British railways the average number of deaths at high-way crossings for ten years from 1897 to 1906 inclusive is 65, as was shown in table 17, and that of the United States is 833, the ratio being 13 to 1. The average for the number of injured on the British railways per year is 28, and that of the United States is 1,572, with a ratio of 56 to 1. This clearly shows that the laws of the British railways are a terror to the people and that the laws have been obeyed.



Accidents to Employees and Passengers.

We now come to accidents to employees and passengers. Happily, the number of fatalities charged to American railways does not grow proportionately with the increase in the amount of traffic.

Between 1900 and 1909 the passenger and freight traffic in the United States increased over 55%, whereas the number of fatalities to passengers in all kinds of railway accidents actually decreased (see table 14). And the fatalities to employees does not show much increase, elthough the number of employees increased from 1,017,653 in 1900 to 1,502,823 in 1909 or 43%. But the number of employees injured increased about 90%, and the number of passengers injured increased about 148%.

From Table 14 it is seen that the average number of employees killed per year for the ten years from 1900--1909 inclusive is 3,267, and the average number of employees injured is 64,752.

The average number of passengers killed for the ten years 1900--1909 inclusive is 381, and the average number injured every year is 8,927.

The following two tables show the enviable record of the British railways in the safe carrying of passengers:

TABLE 19.

Average number of passengers killed and injured in train accidents on British Railways, 1875to 1909.

		kille	f passengers and injured ain accidents.	Number of passeng- erajourneys (exclu- sive of journey season ticket hold-
18751884	(Average)	Killed 28	Injured 915	ers) Millions. 598,400,000
18851894	11	21	600	598,600,000
18951904	11	12	581	1,100,700,000
19051909	11	23	447	1,248,400,000

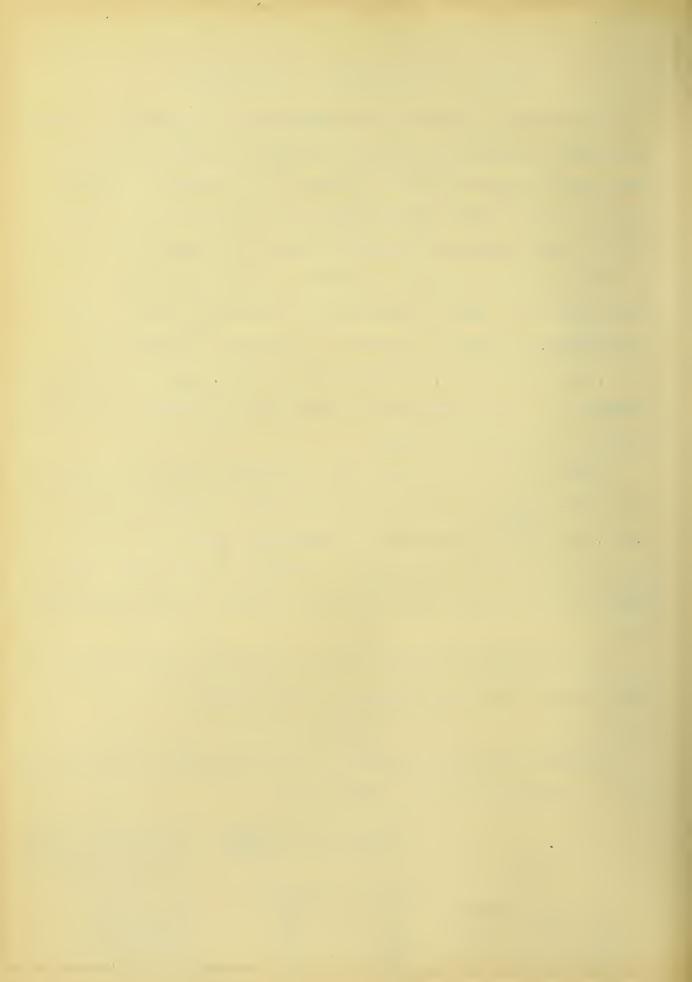


TABLE 20.

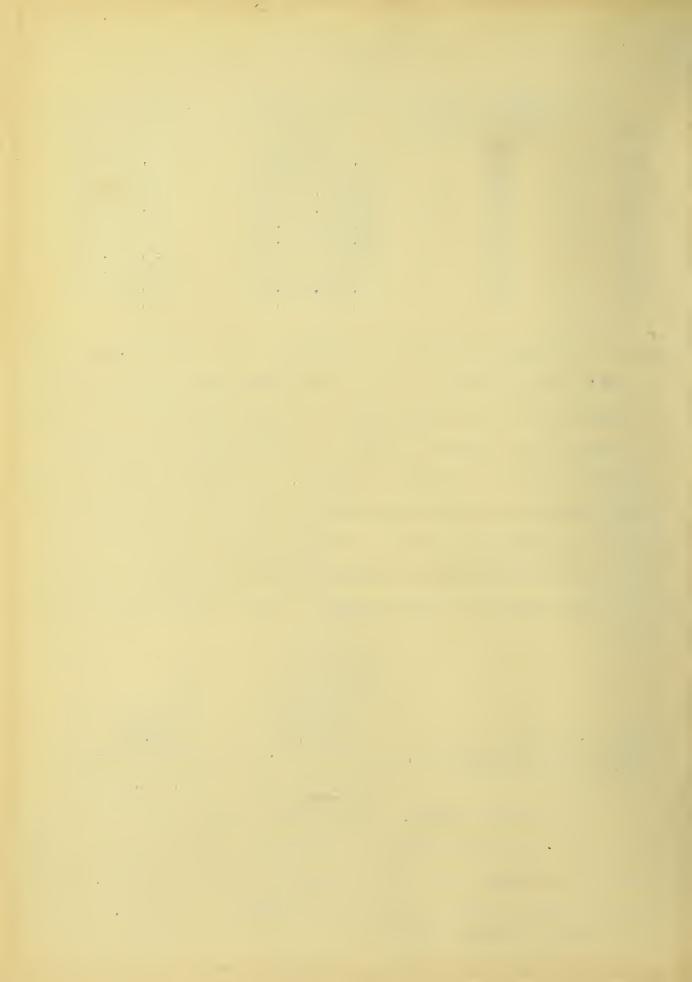
	Passengers carried one	mile to one killed.	, 19001909.
	Passengers killed	Passengers	Passengers car-
Year	in train accident	s carried one mil	Le ried one mile
			to one killed
1909	102	29,452,000,000	288,745,100
1908	148	29,082,836,944	196,505,648
1907	367	27,718,554,030	72,802,600
1906	137	25,167,240,831	183,702,488
1905	350	23,800,149,436	68,000,488
1904	270	21,923,213,536	81,197,087
1903	164	20,915,763,881	127,535,745
1902	170	19,689,937,620	115,823,162
1901	110	17,353,588,444	157,759,894
1900	93	16,038,076,200	172,463,183

Twice in the history of British railways, 1901 and 1908, the Board of Trade was privileged to boast that a year had gone by without a single fatality to a passenger in a train accident. This record is proof of the phenomial safety of British roads and splendid discipline of the employees. However, a comparison between tables 19 and table 20 show that the American mileage is approximately ten times greater than that of British roads. The unit of risk is almost twice as great in America than in the whole of Europe, based upon passenger traffic alone. This is shown in the table below.

TABLE 21.

	All Europe	United States
	1910	1912
Miles of Linel	206,987	248.888
Passengers carried one mile		32,820,623,000
Freight tons carried		
one mile	117,360,167,100	261,416,643,000

In the United States, the passenger service includes very heavy mail and express carriage, while the latter is included as freight in Europe. It is in its enormous freight traffic, however, that the great excess of risk lies on American railways, when com(1) Railway Library--1912.



pared to foreign roads. It has been shown that freight trains figured in 62% of the total collisions, and the fatalities from these collisions are about 55% of the whole.

The difference in mileage, 206,987 to 248,888, between European and American railways does not bring out the true comparison of railway conditions of the two. In the United States there are 120,000 miles of auxiliary tracks, a greater mileage than the main tracks of Germany, France, Austria-Hungary, Belgium and the United Kingdom combined. Accidents are possible in every mile of these tracks. As the Public Service Commission of New York said recently, "Collisions are possible on almost every mile of railroad in the United States. If it is true of collisions it is also true of other classes of accidents."

Now coming back again to the figures of the United States as shown on table 14., it appears that 3,267 employes were killed every year from 1900--1909 and 64,752 were injured. What is the real cause of this ghastly figure? Some people affirm that it is due to the fault of the employees, that they are reckless in their work. But the workmen claim that this not the case. They say that they are forced to take unusual risks, and cite the question of low wages as pertinent to the discussion. Could the element of wages come in as a contributing cause of accidents? In the first place let us consider how the pay of the American railway employee compares with that of the European employee.

These figures show that the European railway employee receives less than one-half and often less than one-third the annual compensation paid to American railway labor. This low compensation exists in spite of the fact that they have less accidents than

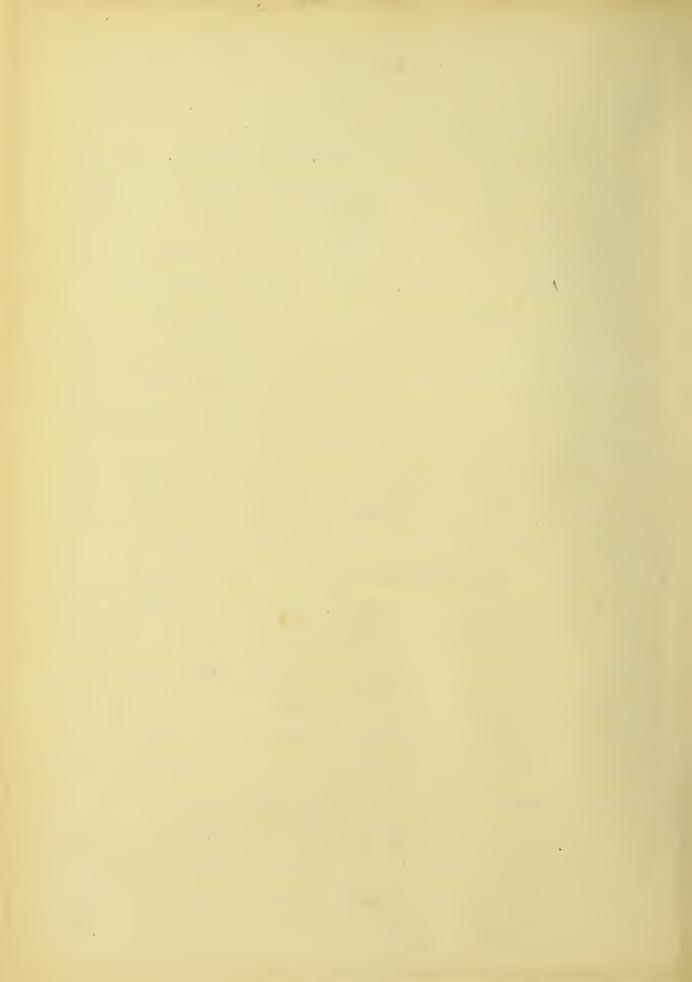


TABLE 22.

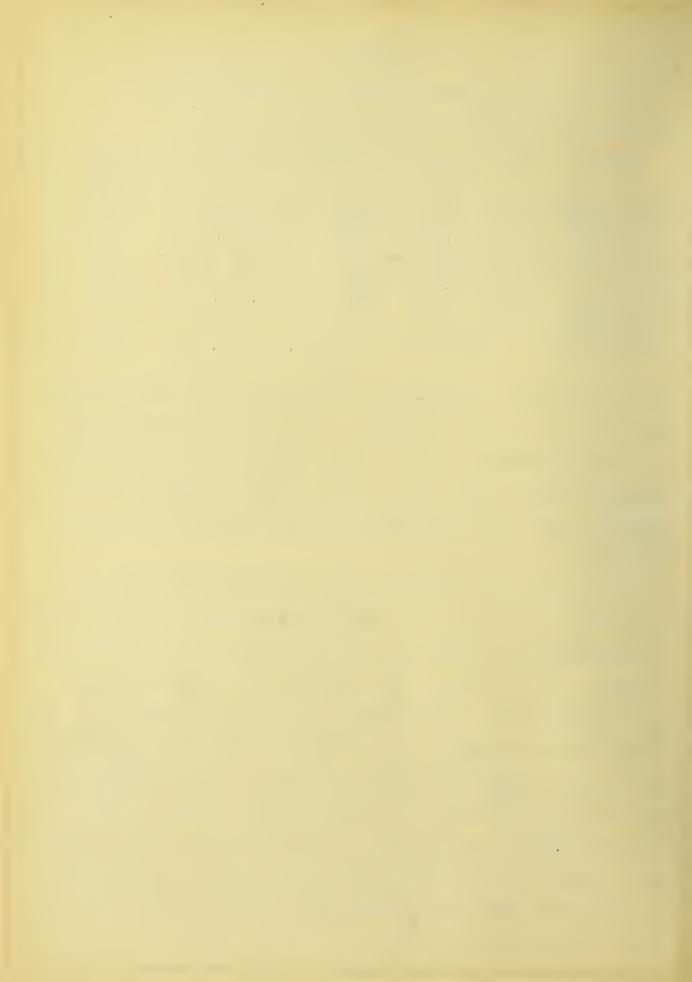
Summary showing number of employees, compensation and Average yearly pay of the principal European Countries.

Country	Year	Miles o		_		Ratio
		Railway	ees No	. per year	_	to
				H	year	Rev.
United Kingdom	1911	23,417	608,750	\$164,294,320	\$270	26.6
German Empire	1910	36,740	700,370	271,856,775	388	37.3
Austria	1909	13,873	279,034	77,230,000	277	42.2
Hungary	1910	12,800	130,945	36,992,558	283	39.1
Russian Empire	1908	41,888	844,100	165,366,939	196	38.8
France	1908	24,915	422,790	115,125,400	260	34.4
Italy State	1907	8.762	127,372	36,462,071	287	46.4
Switzerland	1907	2,740	41,973	12,279,928	292	31.9
United States						
of America		236,444 1	,690,709	1,239,425,284	733	44.2

the United States. The higher rate of wages of American employee does not show that he gives a more efficient service in return.

The real cause of these accidents to employees is due wholly to carelessness. These railway men are taking chances every day like a gambler. The only remedy for this human failure is strict discipline.

The Federal Government has diplayed considerable activity in attempting to prevent accidents among employees and passengers. This has been done because the travelers and employees on railroads demanded such protection. The adoption of the safety appliance act of 1893 was the first attempt of the Federal Government to deal with railroad accidents. This law dealt with a class of accidents, the causes of which were plainly apparent. The wholesale killing and maiming of employees in the early years through the use of link-pin couplers and drawbars of uneven height had been a crying evil. Agitation for reforms had been carried on by the railroad journals throughout the country; state railroad commissions had



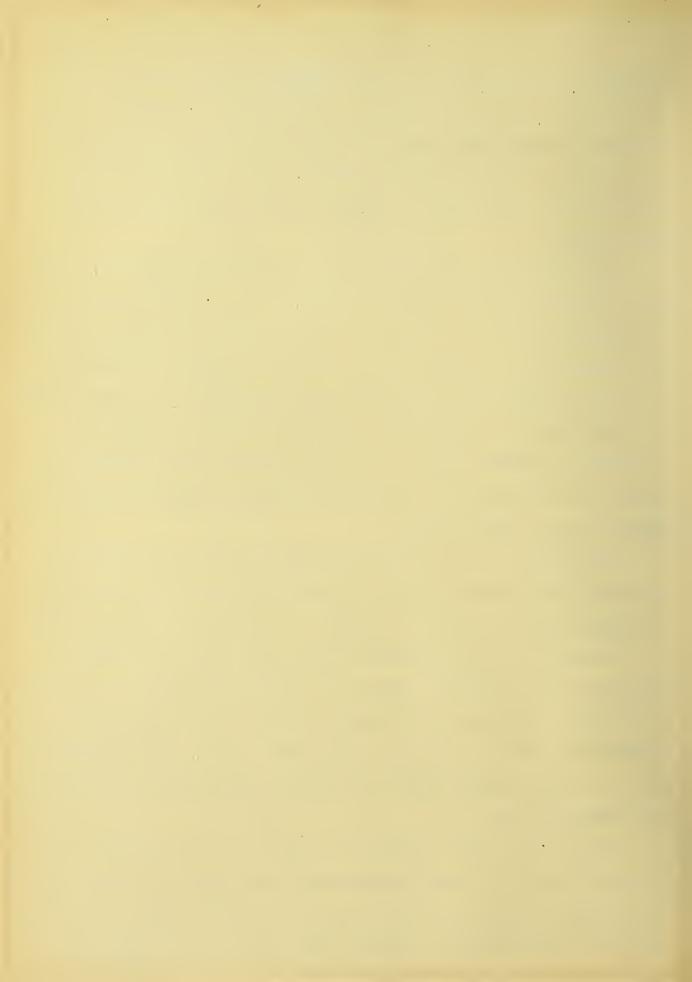
discussed the question and in many states laws were enacted requiring the use of automatic couplers. But, instead of improving the condition, these state laws made matters worse because each state prescribed a different type of coupler, thus destroying the uniformity that is essential to safety where cars are universally interchanged.

This safety appliance act, which was passed in March 2, 1893, made it unlawful after January 1, 1898, for any railroad engaged in interstate commerce to use on its line in moving interstate traffic any locomotive not equipped with a power driving wheel brake and appliance for operating the train brake system, or to run any train in such traffic that had not a sufficient number of cars in it equipped with power brakes so that the engineer could control the speed of the train without requiring brakemen to use the common hand brake for that purpose.

The purpose of this requirement was to reduce the number of injuries and fatalities caused by men falling from the tops of cars or being struck by overhead obstruction while using the hand brake.

However, it is of interest to note that these two kinds of accidents still produce a big list of killed and injured, as shown in Table 2. The average killed from falling from trains, cars and locomotives for the five years from 1905 to 1909, inclusive, was 944. It formed nearly 10% of the number killed and nearly 20% of the number injured.

The act also made it unlawful to use cars not equipped with couplers that would couple automatically by impact and which could be uncoupled without the necessity of men going between the ends of the cars. Again we see in Table 2 that coupling and uncoupling

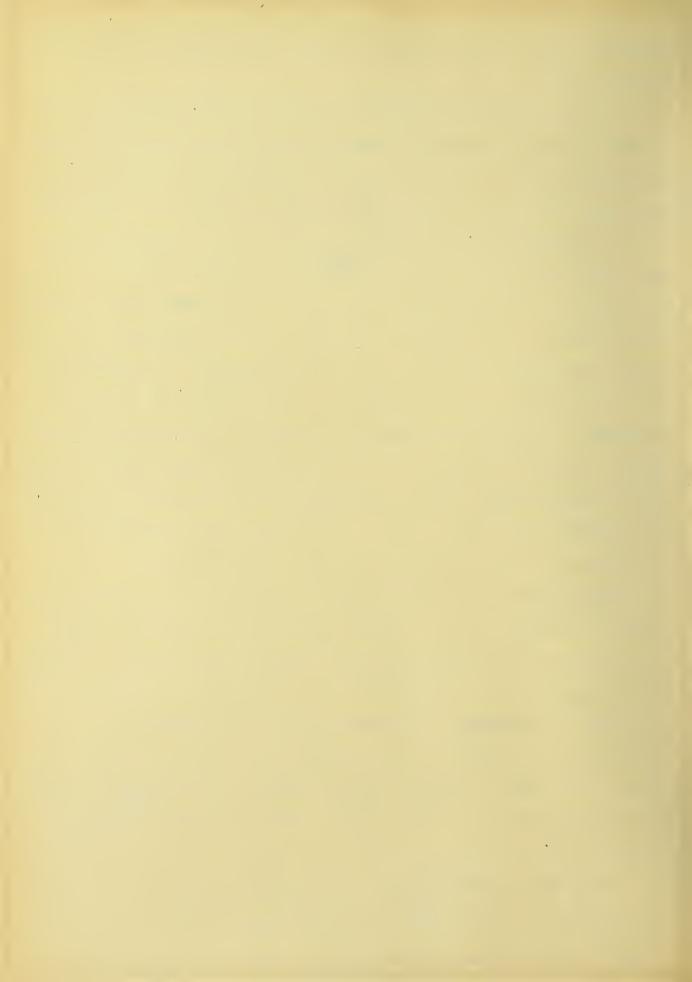


accidents take up about 3% of the total number killed and 9% of the total injured.

In January 1895 the commission issued an order making it unlawful to use in interstate Commerce cars not provided with secure grabinons on their ends and sides. The American Railway Association was authorized to prescribe a standard height for these grabinons. A month after the passage of this act, the American Railway Ass'n. brought in its report end was accepted and legalized by an order of the Commission. This law did not become fully operative until August 1, 1900 because the time limit for compliance with the brake and coupler provisions were twice extended. Defects were found in the law when in operation, and to remedy this error an amendment to the act was approved in March 2, 1903, which provided that a minimum of 50 per cent of the cars in a train must be equipped with air-brakes, and the Commission was given power to increase this number from time to time. In September 1910 the minimum percentage of cars so equipped was raised to 85 per cent.

LTO effect further protection of trainmen and to correct the lack of uniformity in the design, location and methods of applying certain of these appliances as to make them a source of danger to employees, another supplemental act was passed in April 14, 1910. This new act embodies the Master Car Builder's Standards for the protection of trainmen and it requires the equipment of cars with secure sill steps, ladders, running boards, efficient hand brakes, and grabirons on the roofs of cars. This act became effective on July 1, 1911.

This law requires diligent and competent inspection of railway equipment. To do this, the Commission, through the aid of a Congressional appropriation, appointed about two score of men to

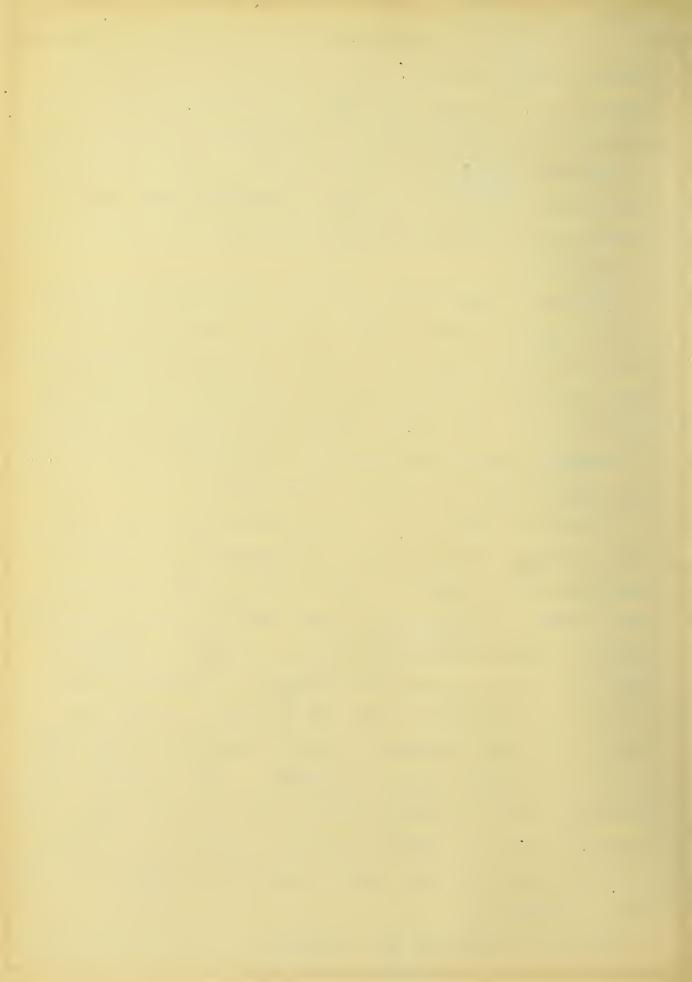


examine railroad equipment, and to see whether or not the law is complied with, and also to see that the equipment is kept in workable condition. Through the help of the courts in placing a liberal construction on the provisions of the law, coupled with careful and efficient methods of inspection, there has been great improvement in the condition of safety appliances and railroad equipment in general.

A complete record of the results of inspection of railroad equipment was first made in 1904. Of every 1000 cars inspected 311.87 were found defective. In 1911 the situation had been very much improved. Out of every 1000 cars inspected there were only 44.63 defective. This shows a reduction of 267.24 in the number of defective cars per 1000 inspected, or more than 85 per cent, in this comparatively short period of seven years.

The safety appliance act has naturally caused a big improvement to the cars and also caused a big decrease in the number of those accidents to employees which the use of these appliances was designed to prevent. In the year 1893 the number of employees killed in coupling accidents was 433, and the number of injured was 11,277. For the year 1909 the number of employees killed in coupling and uncoupling was 137 and the number of injured was 2,278. This shows a decrease of 316% in deaths and nearly 500% of injuries from this class of accidents. Up to June 30, 1911, 98.79% of locomotives and cars were fitted with train brakes, and 99.56% fitted with automatic couplers. To-day it is a very exceptional thing for a train to have any cars that are not equipped with air brakes.

So much has Congress done for the railroads employees through



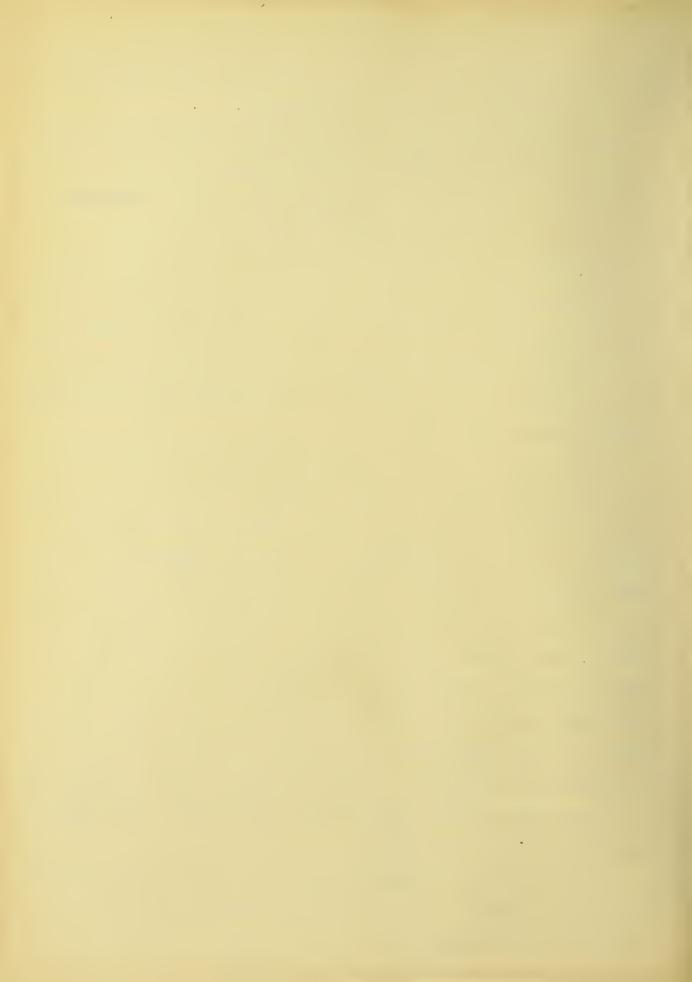
the safety appliance Act. Let us now consider what Congress has done for the better protection of passengers.

In Table 2 it was shown that collisions and derailments were responsible for 1083 deaths and 13,735 injuries every year during the period from 1905 - 1909, inclusive. The amount of damages paid to persons during this period as shown in table 3 was \$114,376,855. For the purpose of obtaining reliable data regarding the causes of these accidents, Congress in 1901 enacted a law requiring interstate railroads to make monthly reports under oath to the Interstate Commerce Commission of all collisions and derailments, giving the nature and cause of the accidents and the circumstances connected therewith.

These reports from the Carriers helped to reveal the causes of the accidents and also helped in giving a basis for adopting proper remedies for their prevention. Most of these accidents were due to human error, such as errors due to dispatchers giving wrong orders, or operators failing to copy orders correctly. In order to take a step in remedying this situation, Congress, on March 4, 1910, passed a law limiting the hours of labor of trainmen and telegraph operators. The enforcement of this law has undoubtedly contributed something to safety in train operations. Other laws have been passed by the states and Federal Government in protecting the lives and limbs of employees and passengers.

Laws regulating the number of men constituting train crews, have been enacted in 21 states.

Laws regulating the number of hours of service of the employees engaged in train service have been enacted in 25 states and by the Federal Government.



Laws regulating the kind of cabooses to be used in train operations have been enacted in 16 of the states.

Laws regulating the kind of headlights to be used on locomotives have been enacted in 14 states.

With all these laws now existing, it still has very little effect toward removing the most prolific causes of railway fatalities, that is, "human error", "human fallibility", and carelessness.

Some Remedies for Prevention of Accidents.

Automatic Signal System.

Carelessness has been the principal cause of railway fatalities even under the most highly approved system of train operation. Such mistakes as passing danger signals are not due only to 'green' engineers, but are also made by well-trained and experienced men. This is clearly shown from a remark made by a general superintendent in the Central States - There have come under my observation and no doubt that of other operating officials, many cases of disobedience of rules under circumstances which can only be explained by the theory that that the individual was afflicted with temporary aberration of mind; and this occurs not with men of inexperience or wanting in intelligence, but often with men occupying the highest position in the train service, with admirable record and of long experience." Why did they violate the rules in the particular instances when accidents occured? In most of the investigations of accidents the employes often reply that they did it to 'make the time". "Making time"is considered by trainmen as their (1) R. R. Gazette--Now. 14,1892.



first duty. This chronic violation of rules has become a habit, and yet these trainmen have never been censured for "making the time", whether in bad weather by their superiors who knew that they must have taken chances by keeping the trains on time. The duty of applying the remedy in these cases rests principally with the railway manager.

What is the remedy and how is it to be applied in order that it may be effective? Carelessness can only be removed by stern discipline. Such discipline could only be accomplished by instructions as to what the risks are and how to avoid them, just such instructions as are issued in connection with the "safety first" movement.

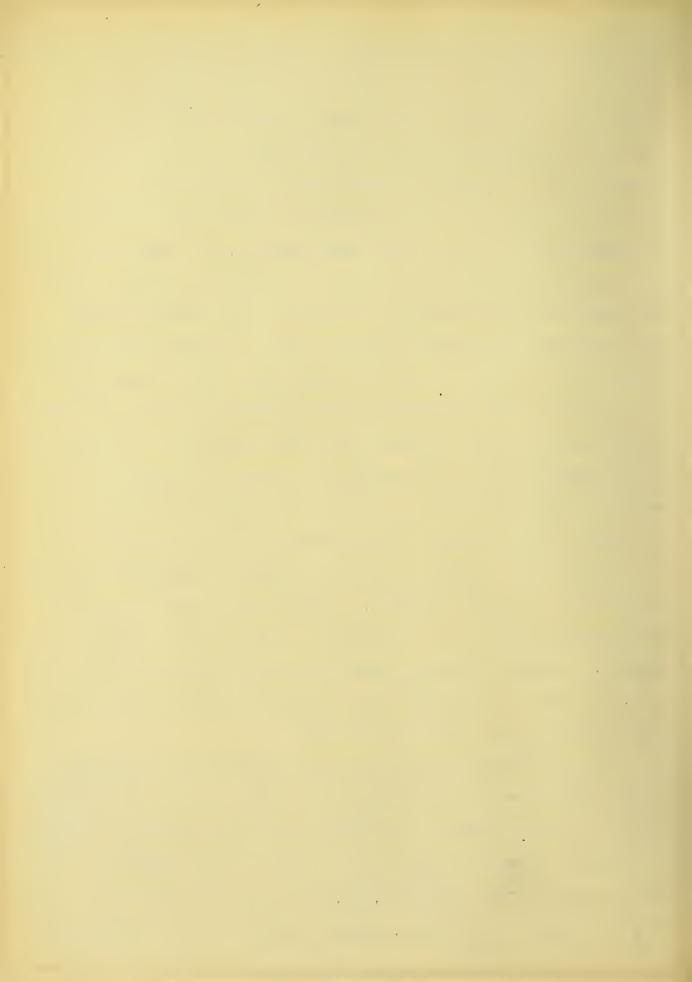
"No signal alone will stop a train", if there is not the proper discipline among the trainmen. The automatic block system has an enviable record for safety upon some roads, but still some of the worst collisions have occurred on block signaled roads. Obviously, the automatic block system can only afford protection when its danger warnings are observed and obeyed. It is true also of the manual block system. In the operation of the manual block system the further difficulty is introduced that the block operators sometimes make mistakes, and these mistakes may lead to fatal results.

Now, if the best signal system cannot afford safety, owing to the fact that careless enginemen will not obey the signals, the question naturally suggests itself: "Is it possible to employ mechanical means that will automatically assume control of a train and bring it to a stop whenever a danger signal is for any reason disregarded?". Automatic stops have been in successful operation



for several years on underground and elevated lines, but their general use on roads in the open country has not yet been considered practicable. To determine the general practicability of such devices, the Interstate Commerce Commission was directed by Congress in 1906 to conduct an investigation of appliances for the automatic control of trains. A board of experts was appointed by the Commission to conduct this investigation, and the investigation by the board extended over a period of nearly five years. Plans and specifications of numerous automatic train control devices were examined and reported upon and tests of several such devices under actual operating conditions were made. In the last report of the Board's investigations, issued December 26, 1911, it states that "the information obtained from tests, together with knowledge of the general state of development of the art of automatic trainmontrol, leads the board to conclude that there are several types of apparatus and methods of application which, if put into use by railroads, would quickly develop to a degree of efficiency adequate to meet all reasonable demands. Such devices properly installed and maintained would add materially to safety in the operation of trains. In many situations under conditions existing in this country, the board is convinced that the use of automatic train stops is necessary to the safety of trains."

Out of the 150 devices which were presented to this board, only 16 have been found satisfactory. Still, some of the 16 which appear to possess decided merit have remained undeveloped for lack of money or business ability on the part of their inventors. We see in Table 3 that about \$60,000,000 is paid annually by the rail-ways in injuries to persons, clearing wrecks and loss and damages,



and if the railway compainies would only appropriate about \$1,000000 out of this \$60,000,000 for the purpose of encouraging the completion of one or two or three of the most promising automatic stop devices the safety of train movement in this country would be materially increased in a short time. Three years have passed since the Board of Signal Control made its last report, and still no improvements have been made in these devices. The automatic coupling device came out after twelve years of delay and perhaps it will take as long for the development of the automatic stop.

Three of the twelve years have gone by now and if the rate of year \$60,000,000 loss to the railways through accidents every is kept up, we see that at the end of the 12th year, when the automatic stop is brought to use, the railroads would have a total loss due to accidents of about \$720,000,000.

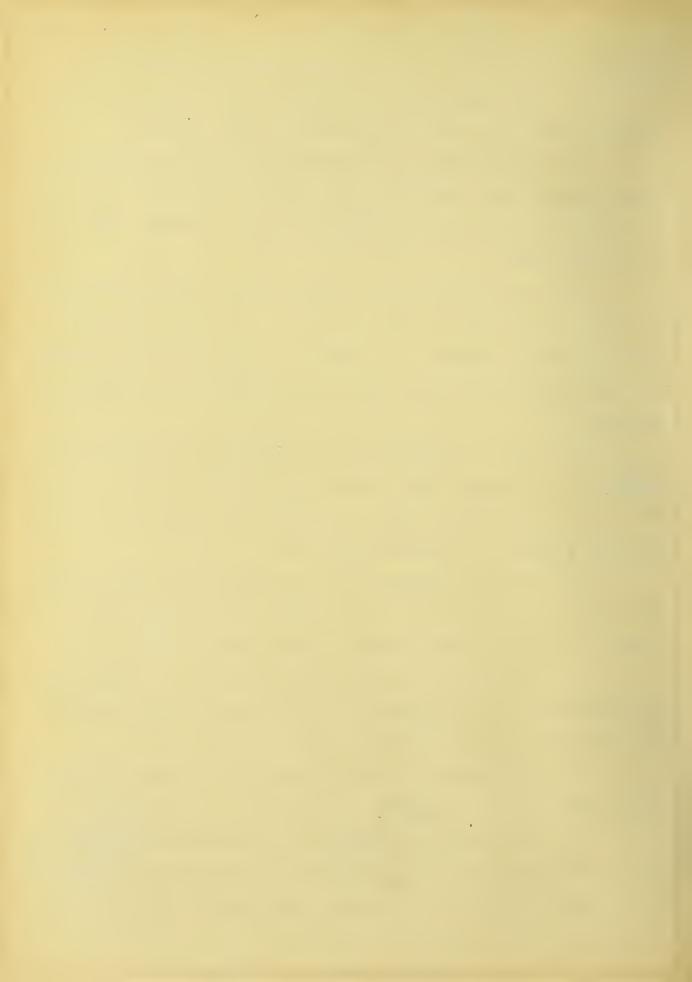
There is a fear among some railway managers that if such a device as an automatic stop be installed on the roads, it will reduce the vigilance of the engineer, and will also make it impossible for trains to get through on time. As for the first doubt, it could be remedied by making the automatic stop self-recording so that the superintendent will know at the end of the day's run just how many times the train has been stopped by this method and the engineman could be readily disciplined if necessary.

The American Railway Engineering Association has taken an advance step in regard to the automatic train stop. The question of the advisability and practibility of using automatic train stops has been under consideration by its Joint Committee on automatic train stops, and in their last meeting held in March 1914, the following requisites as submitted by the committee, (revised from the



original forms submitted by it in May 1913), are recommended.

- 1 1. "The apparatus so constructed that the failure of any essential part will cause the application of the brakes."
- 2. The apparatus so constructed that proper operative relation between those parts along the roadway and those on the train will be assured under all conditions of speed, weather, wear, oscillation and shock.
- 3. The apparatus so constructed that to insure compliance with speed restrictions a train may pass a trip in the tripping condition without brakes being applied, provided that train speed is less than a predetermined rate and the fixed signal indicates proceed.
- 4. The train apparatus so constructed as to prevent the release of the brakes after automatic application has been made until the train has been brought to a stop or the speed of the train has been reduced to a predetermined rate.
- 5. The train apparatus so constructed that when operated it will make an application of the brakes sufficient to stop or control the train within a predetermined distance.
- 6. The apparatus so constructed as not to interfere with the application of the brakes by the engineman's brake valve or the efficiency of the air-brake system.
- 7. The apparatus so constructed as to be operative when the engine is running forward or backward.
- 8. The apparatus so constructed that when two or more engines are coupled together or a pusher is being used the apparatus can be made effective on the engine only from which the brakes are controlled.



- 9. The apparatus so constructed as to be operative on trains moving only with the current of traffic.
- 10. The apparatus so constructed as to conform to the American Railway Association standard of clearances of rolling equipment and structures.
- 11. The apparatus so constructed as not to constitute a source of danger to employees or passengers, either in its installation or operation.
- 12. The apparatus so constructed as not to interfere with the means needed for operating fixed signals.

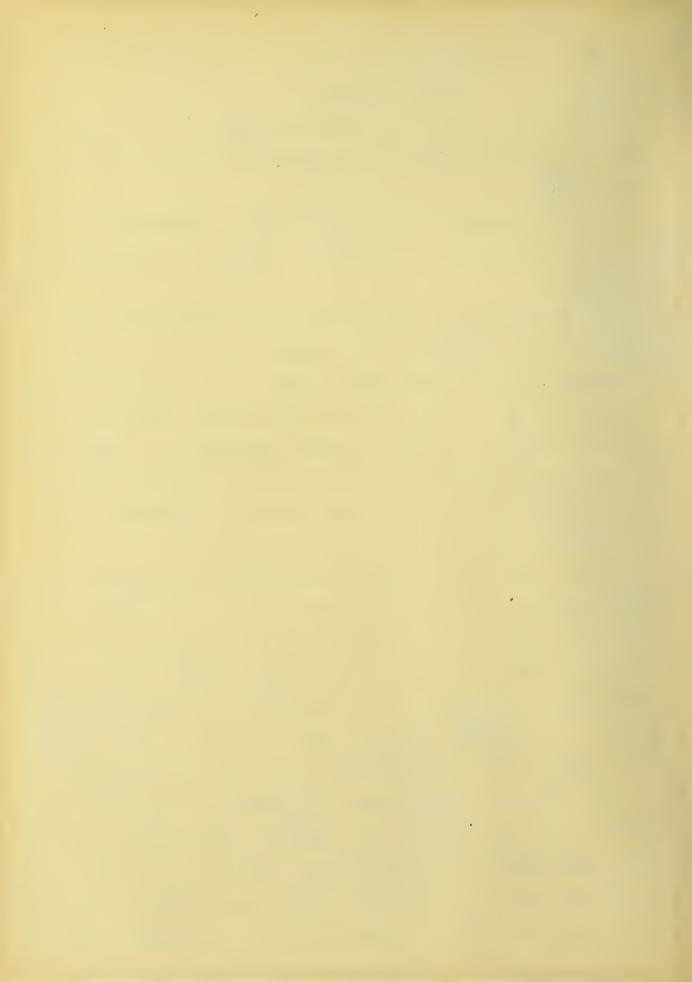
Adjuncts. The following may be used: A. Cab signal, to be so constructed that the failure of any part directly controlling the signal will cause it to give the "stop" indication. B. Recording device; so constructed as to make a record of the number of times the automatic stop has operated the brakes. C. Speed Indicator.

D. Detonation apparatus.

The Cab signal system has been successfully used in France during the past few years. It has been tested in quite a few accidents and found to be one of the correct remedies to eliminate collisions.

The Speed Indicator has just been brought into use by the Baltimore & Ohio R.R. on many of its locomotives in through and local service. The recorder rings the gong and displays a flash light in the cab when the engines exceeds the prescribed speed limits.

With the present signal system collisions never seem to be decreased. The only remedy to this danger is the adoption of automatic train-stop, and such an apparatus should be within the requirments which were suggested by the American Railway Ass'n. The automatic train stop has been successfully used in Europe as shown by



the line between Vienna and Kreurs. It worked very consistently in spite of weather conditions. There is no reason why such an automatic stop should not be used on the American Railroads to eliminate these thousands of collisions every year with their terrible results.

The objection to such a device from the railroads would be its cost. As a matter of fact it would probably not cost the railroads any more than what they are now paying out every year for accidents, but they will not submit to the automatic stop until compelled by law to do so.

Table 23 illustrates how the railways may save money by installing the automatic stop. In Column I, the amount includes injuries to persons and property, and clearing wrecks, the total cost resulting from accidents during the year ending June 30, 1908.

Column II is obtained by taking 15% of the total cost in Column I which is assumed could be saved by an automatic stop.

Full Train Crew Bill.

Another remêdy which has been urged as being essential to eliminate accidents is the "full crew bill". Among the states in the Union which have pass Full Crew Bills to eliminate accidents are: Arizona, Arkansas, California, Connecticut, Indiana, Maryland, Missouri, Nebraska, Maine, Nevada, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, Texas, Washington and Wisconsin. This "full crew bill" is a measure which compels the railways to employ so many men for a train crew. All of these laws enacted in the above states differ a little so that uniformity is very badly needed. There is no federal train-crew law enacted yet, but within the last four years eight bills have been presented

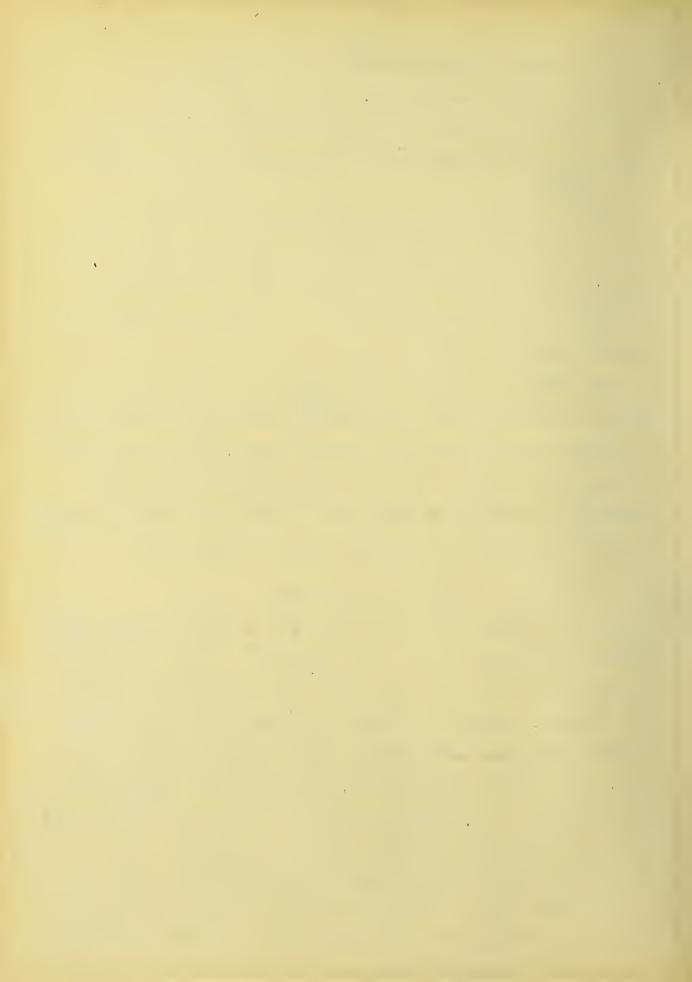
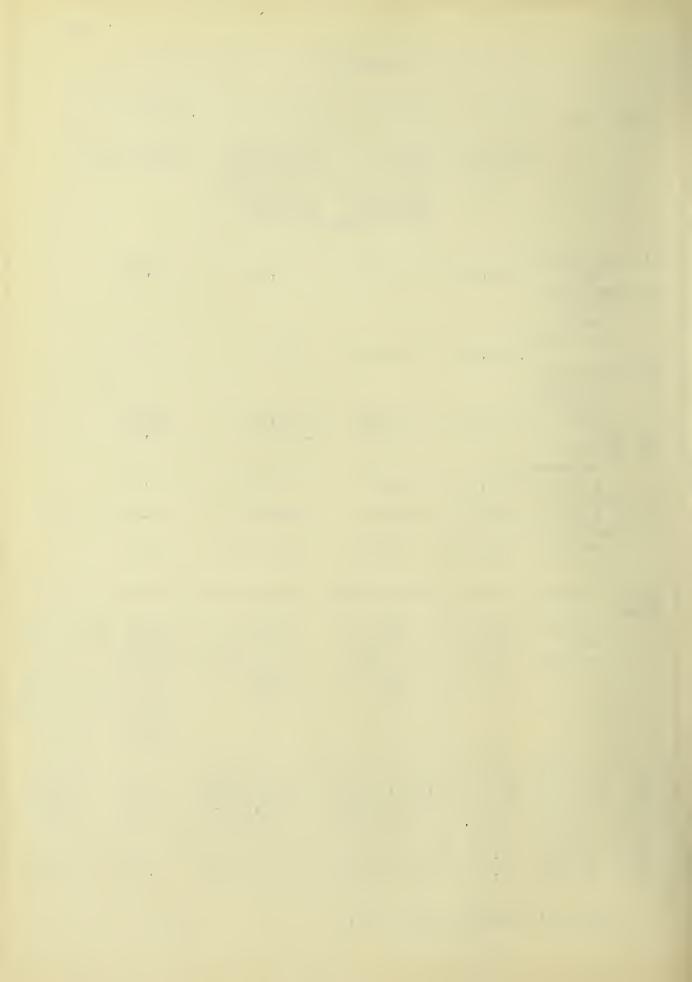


TABLE 23.

Railroad Column	I Column II	Column III Co	olumn IV
Cost o Accide: 190	6 which would	stallation d of Automatic y train stops on whole	Annual Maintenance
(1) Boston and Naine 1,198, (2) New York, New Haven &	875 180,000	987,000	49,350
Hartford 1,025, (3) New York Central	155 153,000	988,500	49,425
& Hudson River 1,973, (4) Erie 756, (5) Delaware,	008 296,000 084 113,400	1,711,000 1,036,000	85,550 51,800
Lackawanna & Westernl29,	685 19,400	174,000	8,700
(6) Delaware & Hudson 285,	763 42,800	330,000	16,500
(7) Lehigh Valley 346,	,619 51,900	649,000	34,700
Rail- Column V Coluroad	umn VI Column VI	I Column VIII	Column IX Col. X
Annual Intended net earn saving the	erest Total ned on surplus in- on hand tment June 30, 1906	earned for	Number of Percent- years for age of annual total surplus surplus earned to to pay pay for for auto automatic matic stops. stop.
(1) 130,650 13.29 (2) 104,375 10.59 (3) 210,450 11.89 (4) 61,600 6.09 (5) 10,700 6.29 (6) 26,300 8.09 (7) 17,100 2.59	% 15,509,885.09 % 17,268,423.83 % 11,794,461,54 % Not obtainabl	3,718,285.41 2,953,004.56 533,974.71 e Not obtainable	4.55 37.4% .26 6.3% .58 9.9% 1.94 8.6% 9

Cassier's Magazine-May 1908.



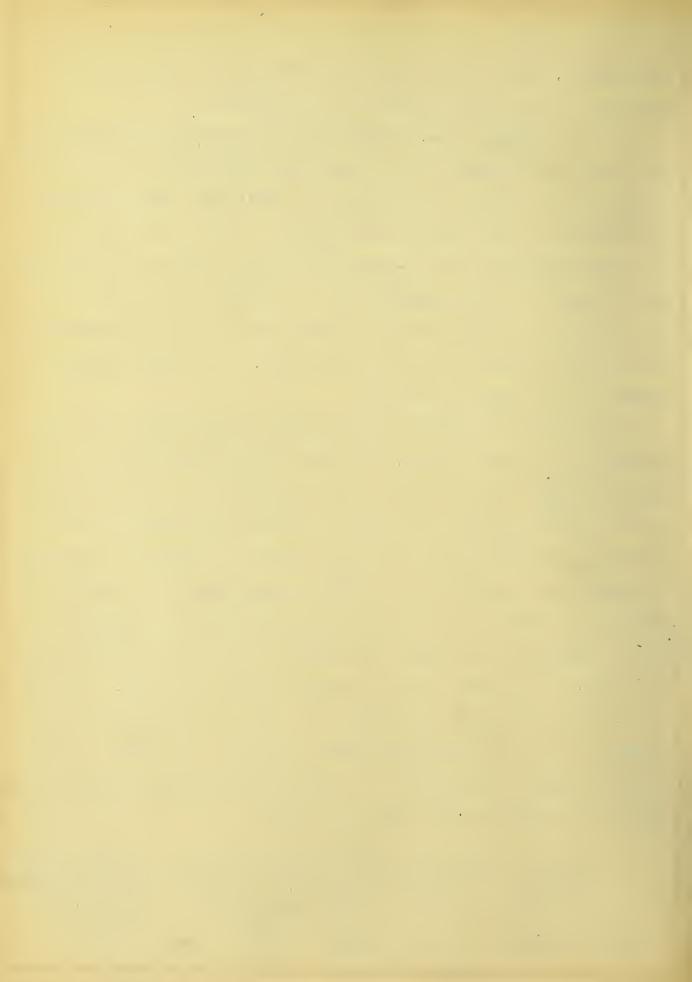
in Congress, each of which would have compelled the employment of more men. None of these eight have been passed.

Engineers was made upon the argument that the conditions in the operating of trains differ so much from the early days that a full-crew is necessary to give safety in all cases. In the early days the cars were adjusted with pin-couplers and hand-brakes. The pin-coupler method is very dangerous and has proved the death trap to rail-way trainmen. The application of hand-brakes is just as dangerous as the pin-couplers were in the early days, since the brakeman is exposed to all kinds of weather.

In 1868 the Westinghouse air-brake for passenger trains was brought into successful use, and later it was applied to freight trains as well. This invention has eliminated a very great percentage of train accidents. In 1893 the 'Safety Appliance Act' was adopted by Congress and this act also helped to reduce the percentage of deaths and injuried. All of these improvements in equipment have had a great effect upon the work of railway trainmen. The brakemen no longer have to place wood or coal in the stove to the passenger cars, as the steam from the locomotive does the work. Furthermore, the coupling and uncoupling of a train is now done by simply turning a rod extending to the side of the car. This new device, which has materially reduced the hazard of coupling and uncoupling cars, is indicated by the following table:

TABLE 24.

C	asualties to t	rainmen	from coupl	ing accident	s, 1890-and 1910.
Year	Total No. of	Total	Total No.	killed for	No. injured for
	Trainmen	killed	injured es	ach 10,000 rainmen	each 10,000
			נד	rainmen	trainmen
1890	153,235	265	6,073	17	400
1910	318,632	174	2,826	5	88
1890 1910	153,235	265	6,073	17	



The duties of the train crews to-day are entirely different from those of the early days. Many of the responsible duties which the trainmen used to undertake are now turned over to a different member of the crew, while other duties have been eliminated by the improved devices.

Does a full train crew increase the safety of train movements. The Brotherhood of Locomotive Engineers said it does, and the rail-way companies argue that it does not increase safety of train movement, while increasing operating expenses. This is shown by the estimate below as compiled by a Special Committee on the Relation of Railway Operation to Legislation.

TABLE 25.

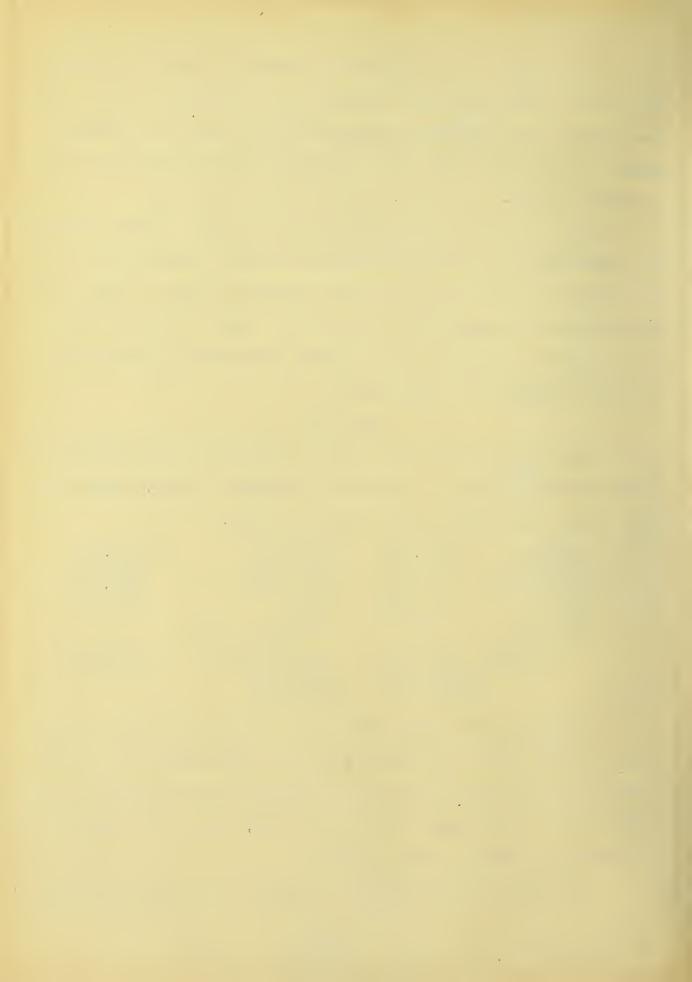
lestimates of Additional Annual Expenses to the Railways in certain States, so far as reported to October 1, 1913, resulting from Train Crew Laws enacted by those States.

Arkansas Indiana	\$179,085 244,052	Nebraska New Jersey New York	\$ 24,267 281,851 854,016
California Maine	66,297 602	Ohio	139,592
Maryland	96,921	Oregon	200,000
Missouri	7,0	(O.R. & N. Co.	
(a general		alone	47,700
estimate		Pennsylvannia	1,211,233
	Washington	\$158,026	
	Total	\$3,903,042	

This figure has been estimated on a few roads only, which lie in states where a full-crew bill has been passed. If the contention that no additional safety in train operation attends the enforcement of the full-crew bill, is true, then such expenditures are unfair and wholly without reason.

The Special Committee on the Relation of Railway Operation

⁽¹⁾ Bulletin No. 53. Bureau of Railway Economics.



to Legislation made inquiries early in 1910 of all the railways of the United States as to the cost of complying with the fullcrew bills which were introduced in Congress in 1909 and 1910. The following table is a summary of the replies received by that Committee.

TABLE 26.

Estimate 1910

Mileage Amount of additional annual cost of No. compliance with full-crew bill. Roads replying 166 205,547 \$18,328,302.32 Estimated for other roads exclusive of Canadian and Mexico 23,254 1,953,336.00 roads 126 20,281,638.32 Total 292

Again in 1912, another bill was introduced in Congress which required that on each freight train containing 25 or more cars the crew shall consist of at least an engineer, a fireman, a conductor, and three brakemen, "regardless of any modern equipment of automatic couplers and airbrakes." To ascertain the burden on the railways in regard to this proposed law the Special Committee on Railway Operation to Legislation again made inquiries to all the railways in the country. The following is a summary of the replies received from 143 operating companies.

TABLE 27.

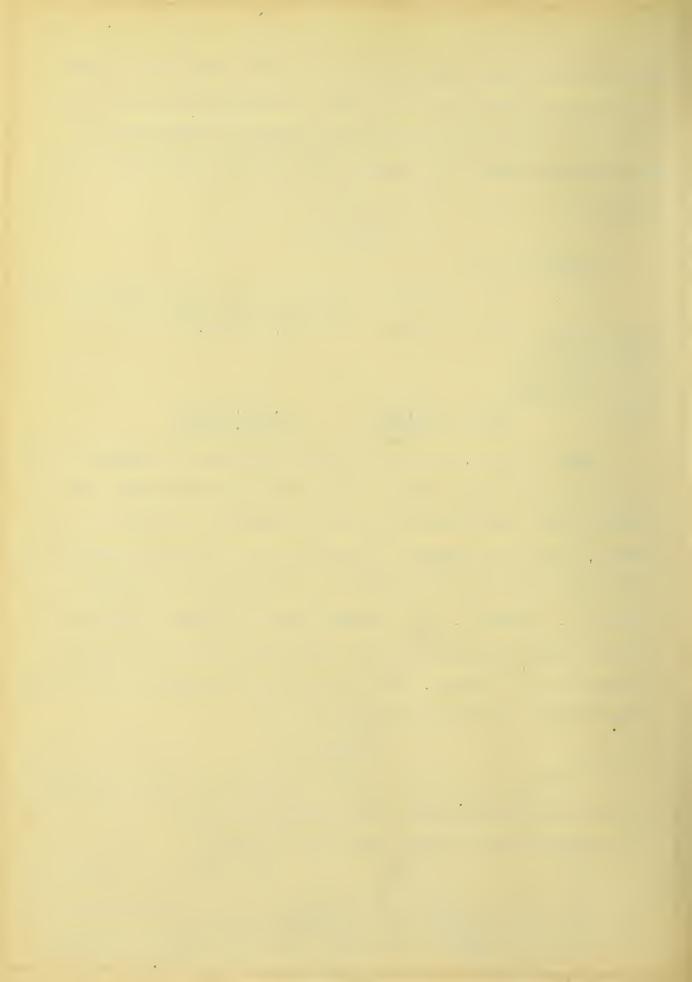
Estimates of cost, in 1912, of Train-crew Laws furnished by 143 operating companies operating 195,049 miles.

Trains affected by state laws then in effect, 678,6613 per annum

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Does not include states where laws were passed subsequent to 1911.



Additional trains effected by proposed Federal law in states then having full-crew laws, per annum \$ 468,483

Trains affected by proposed law in states then having no full-crew law, per annum 3,211,056

Total trains affected by state laws and proposed
Federal statute, per annum
4,358,200

Cost of compliance with state laws then in effect, per annum 1,797,589.94

Additional cost of compliance with proposed law in states then having full-crew law, per annum 1,342,237.17

Cost of compliance with proposed law in states then having no full-crew law, per annum

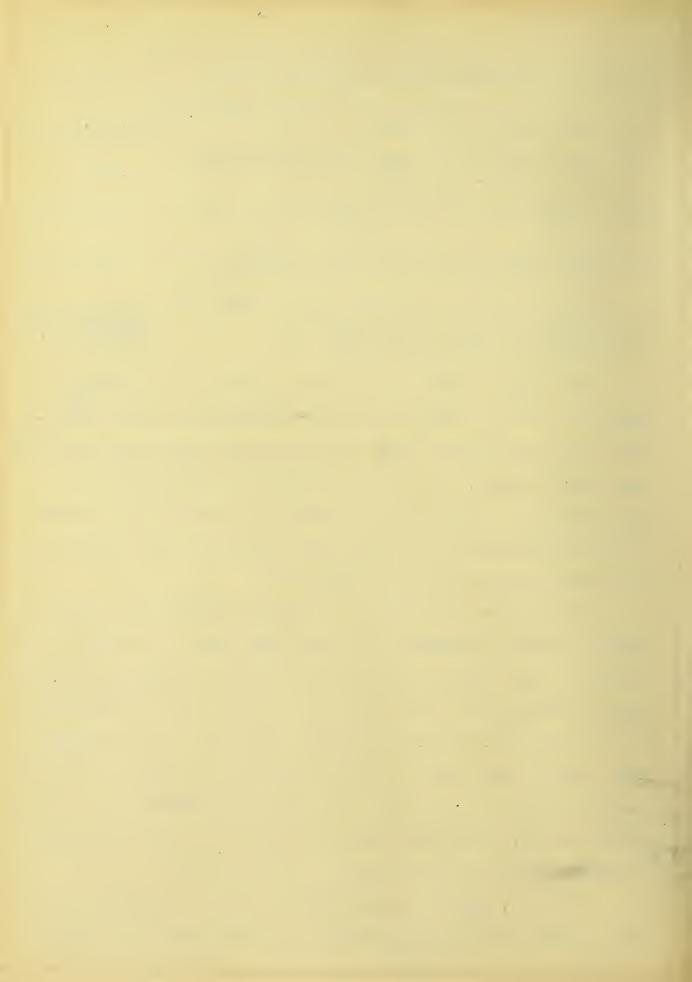
Total cost per annum of compliance with state laws and proposed statute.

10,255,790.66
\$13,395,617.77

The figures show that the total expense to the 143 companies to meet the Federal and state legislation is \$13,395,617.00 This amount has clearly shown that train-crew legislation increases operating expenses, but is not a conclusive argument against it. The legislation is intended, presumably, to promote the interest of the public and to see whether any benefit has been derived by the public either directly or indirectly.

It has been estimated by the Special Committee on the Relation of Railway Operation to Legislation that if the \$13,000,000 is taken as the annual interest at 5 per cent on \$260,000,000.00, and with that capital the block-signal system could be installed on all railway mileage of the United States not now so equipped. This clearly shows that train-crew legislation would cost the railroads at least as much as the universal installation of the block-signal system, which would unquestionably be a better investment from the standpoint of the railways and the public.

However, there is a considerable amount of argument in regard to this full-crew bill between the Brotherhood of Trainmen



and the Interstate Commerce Commission and the Railways. The writer does not wish to go into details of this case¹, but would draw a conclusion from the study of the argument. The writer believes that full train crews do to a small extent help to prevent accidents, but the method which the states undertook seems to be too costly a remedy, considering the small results obtained.

Steel vs. Wooden Cars.

There seems to be no room for doubt that wooden cars are very dangerous in time of accident. This has been clearly shown in wrecks where many lives have been lost due to the demolition and The accident at Ashtabula, Ohio, in splintering of wooden cars. December 29, 1876, illustrates clearly the danger of wooden cars in the early days of railroading. The train which was wrecked consisted of two heavy locomotives, four baggage, mail and express cars, one smoker, two coaches, one dining car and three sleepers. There were 190 people in the train, of which 170 were passengers. The train was crossing a bridge at a slow speed. Before it reached the far end of the bridge the bridge failed and the whole train with its cars went down into the river, which, at the time, was covered with snow and ice. Fire started immediately from the overturned stoves which were used in those days to heat the cars. number of deaths totaled about eighty, and the number of injured about sixty, although the exact number never could be ascertained.

Wooden cars still play a vital part in maiming people in time

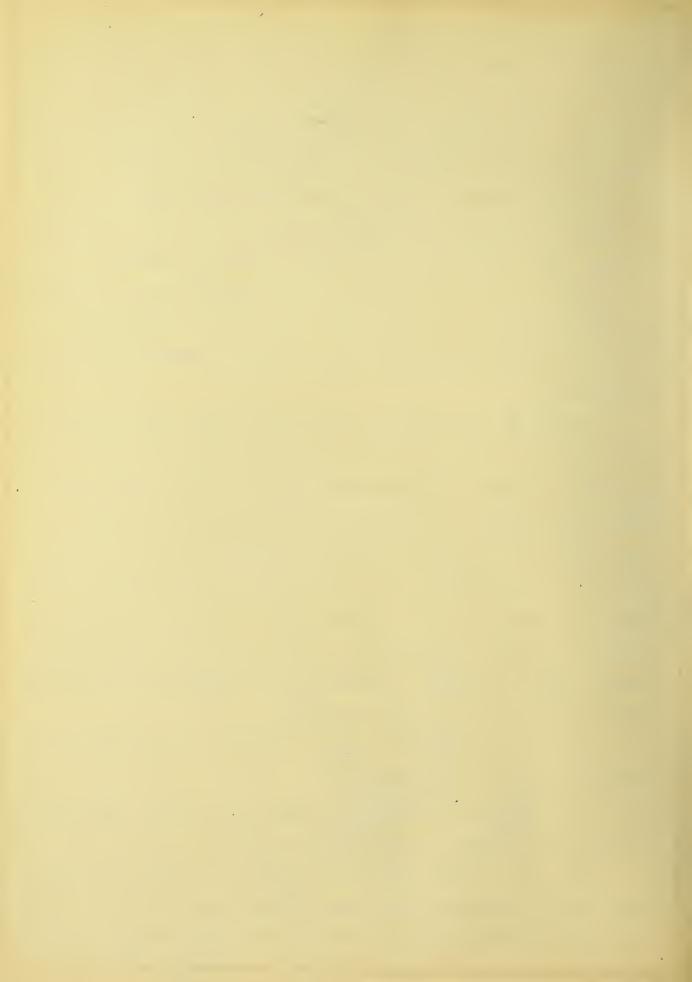
⁽¹⁾ For further reference see pamphlet on "The Argument For and Against Train-Crew Legislation".-Bul. #53. Bureau of Economics Washington, D.C.



of wrecks. To show that the wooden car still is an important factor in increasing loss of life in wrecks, let us consider the following example. On November 13, 1913, a passenger train on the Central Georgia Railway was derailed by a broken rail near Clayton, Alabama. The train was made up of wooden coaches which were built in 1883. The number of passengers killed was nine and the number of injured was 390. This gives us an idea of how horrible and deadly these wooden cars are in time of wrecks. Many such accidents are taking place with disastrous results, while, on the other hand, steel coaches in similar wrecks never fail to show a minimum of killed and injured.

The horror and danger of these wooden cars has long been realized by the railways and the public, but there was little agitation to remedy the matter until quite recently. The use of metal for passenger car construction was considered as early as 1854, but it did not receive serious consideration until about 40 years later. The inferiority of the wooden cars has at last been more fully realized by the railways, for at the meeting of the Master Car Builders' Association, in 1908, the committee on Steel Passenger Cars reported the desirability of introducing steel passenger cars for the following reasons.

- (1) The burning wooden cars in wrecks, and the frequent destruction of human life by fire.
- (2) The splintering of the large wooden sills, etc., when the cars were wrecked, causing injury and death.
- (3) The scartity of lumber suitable for sills, stringers, etc., and the threatened exhaustion of such material.
 - (4) In collision with steel freight cars, which were being



introduced in great numbers, the passenger equipment was more liable to destruction than was the case with the wooden freight cars.

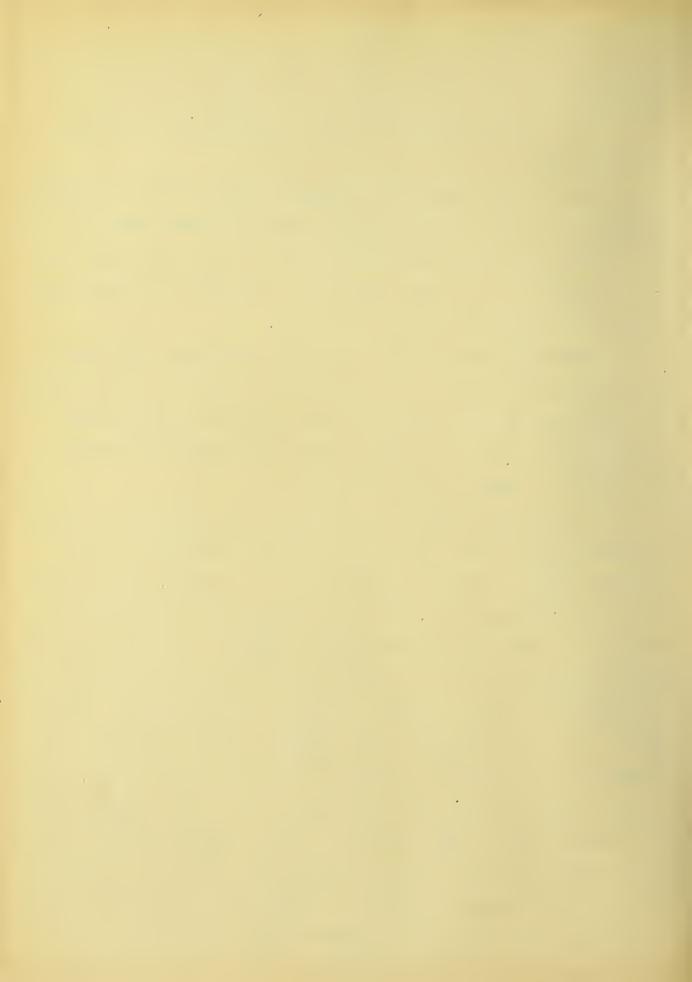
(5) Increased speeds, greater train lengths, and larger capacity cars.

The electrification of suburban, subway and elevated equipment has quickened the movement in replacing wooden cars with steel.

It is also true that these steel cars have proved to be safer and more economical to maintain than wooden equipment. This has been tested on the Harriman Lines in the West.

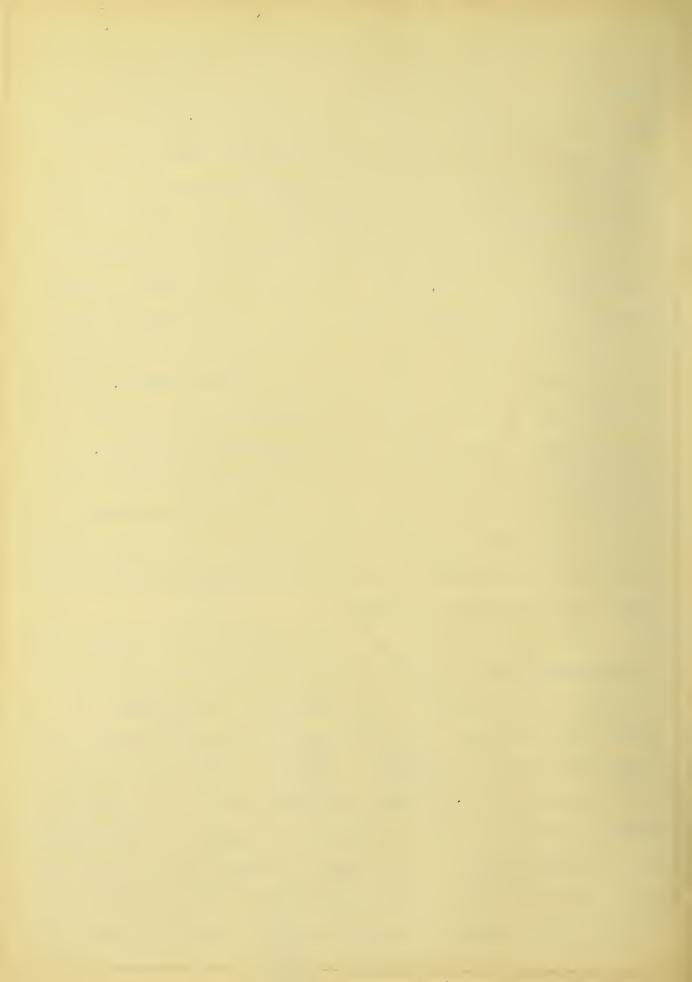
There is really no doubt that steel passenger train cars have given a good account of themselves in wrecks. This has clearly been demonstrated in collisions and derailments where steel cars in many cases have suffered very great punishment without much interior damage or loss of life.

An excellent example was furnished by a head-end collision between two passenger trains on the Missouri Pacific at Brant,
Missouri, May 27, 1913, as reported by E. W. Belnap, chief inspector of safety appliances, who said: "This accident affords exceptionally interesting opportunity for comparison between wooden and steel equipment. Both trainswere travelling at about the same rate of speed, and one had a wooden car immediately behind the locomotive, while the other had a steel car in a similar position. The wooden car was completely wrecked and was destroyed by fire, which broke out afterwards, while the steel car was badly damaged only on the end adjoining the locomotive, even the window glass in the other part of the car not being broken; all this notwithstanding the fact that the steel car had the weight of six cars behind it, while the wooden car had the weight of only four cars."



Again the steel car demonstrated its usefulness in the New York, New Haven & Hartford rear-end collision at North Haven, Conneticut, on September 2, 1913. In the Interstate Commerce Commission report about the wreck was contained this statement: "It is interesting, however, to note the contrast between the condition of the wooden cars involved in this accident and the steel cars involved in a similar collision on the Pennsylvannia Railroad at Tyrone, Pa., on July 30, 1913. In each case the speed of the approaching train is thought to have been about 40 miles per hour. In the Tyrone accident the train which was struck had just started from the station but had moved only about one car length, while in this accident the train which was struck was standing still. In this accident the two rear cars were completely demolished, the third car badly damaged, and 21 passengers killed. In the Tyrone accident, however, none of the cars were destroyed, although several were quite badly damaged on the ends, and none of the passengers were killed. The shock of the collsion was absorbed by the crushing of the platforms and vestibule."

The Tyrone wreck was one of the most severe in which steel cars have been concerned, and a study of the behavior of the cars has been of much interest to the public and the railways. If steel cars have proved their usefulness, then why don't the railways adopt this type of car? The answer is that the railroads have already partially adopted steel cars but are not pushing them ahead as rapidly as desired on account of financial contingencies. The following figures show the extent to which the steel car has come into use on the railways of the United States, according to Bulletin 53 of the Special Committee on Relations of Railway Oper-



ation to Legislation on January 1, 1913. The report showed that there were 247 railroads in the United States, owning 57,493 passenger cars, and operating 227,754 miles, Of these cars a total of 7,271 were all-steel cars, 3,296 steel underframe cars, and 46,926 wooden cars. Steel-cars are even more rapidly displacing the wooden cars during the past two years. This is shown by the following table which is taken from that bulletin.

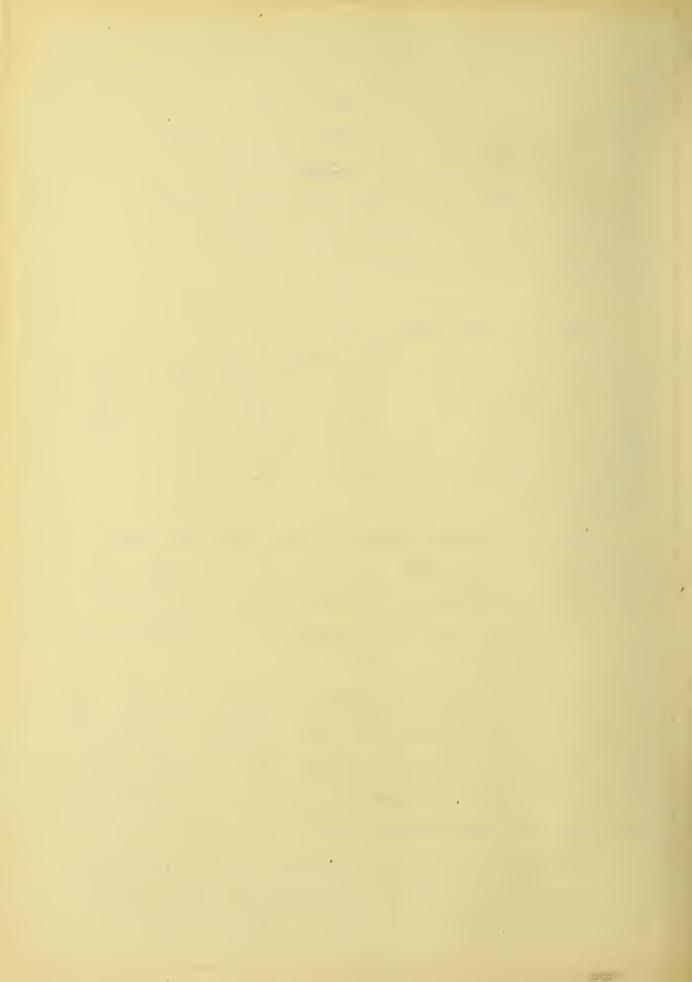
TABLE 28.

Steel Passenger Cars in Use.

	Percentage					
Year	Total Number	Steel	Steel Underframe	Wood		
1909	1.880	26.0	22.6	51.4		
1910	3,638	55.4	14.8	29.8		
1911	3.756	59.0	20.3	20.7		
1912	2.660	68.7	20.9	10.4		
January	,					
1913	1,649	85.2	11.5	3.3		
(Under	_,					
Constru	ection)					

For the first six months of 1913 orders were placed by the roads included in the above report for 1,140 passenger cars, of which 1,064 or 93.3 per cent, were of all-steel construction, and 76 or 6.7 per cent, had steel underframes. No wooden cars were ordered.

If steel cars are to replace the wooden cars, how long will it take to have the 47,000 wooden cars replaced, and what will it cost? According to statistics compiled by the Railway Age Gazette, for the past five calendar years a little more than 16000 passenger cars--wood, steel-snderframe, and all-steel--were built for use in the United States. This is at the rate of about 3,200 a year. From the estimate of two of the largest car builders in the country we learn that 3,500 steel cars(with the present facilities) could

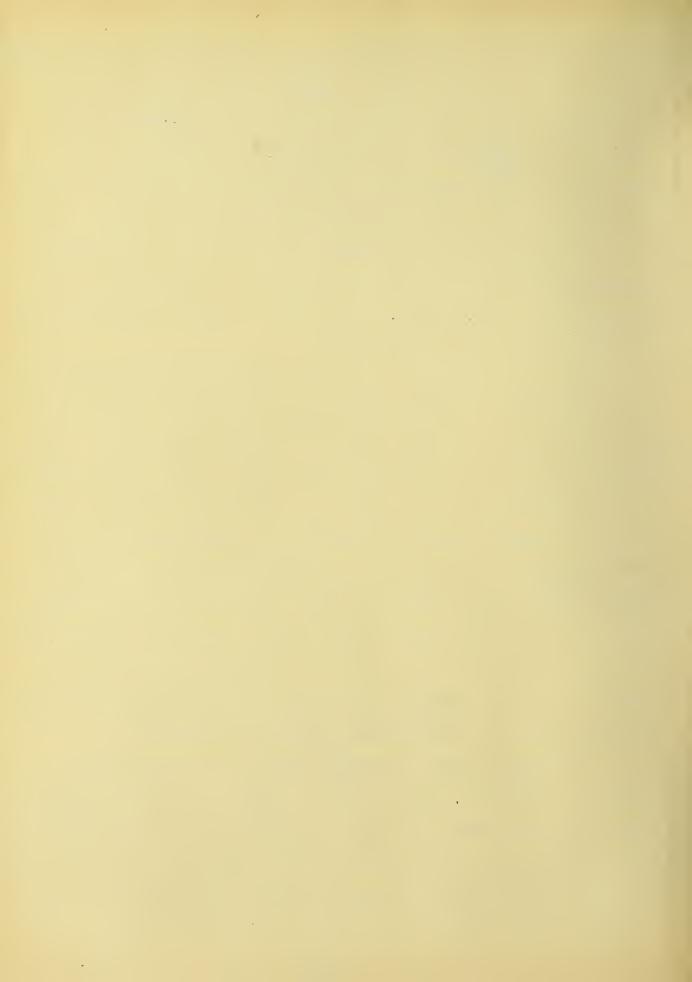


be built each year. The Committee on Relations of Railway Operation to Legislation indicates that the maximum number of all-steel cars which can be built at the present time is about 4,630 per year. Then taking the figures of the Committee, 4,630 per year, the Railway Age Gazette shows that it would require at least ten years to replace all the wooden and composite cars in use to-day.

The estimated cost in replacing 46,926 cars by the Special Committee on Relations of Railway Operation to Legislation in its Bulletin 53 is \$614,619,100. This amount is made on the basis that the coaches cost about \$12,800 each.

Here again, the steel car as a remedy for accidents has been criticised by a great many railroad officials. The item of cost and measure of safety obtained is brought to question. The Literary Digest in its October 4, 1913 issue stated, "As no wreck was ever prevented by steel cars, some observers are asking just now if the popular craze for these vehicles would not be better directed toward the elimination of causes of accident, instead of taking it for granted that every train will some day go to smash, and building it like a safe-deposit vault. One editor inquires if it wouldn't be better to insist that there be no collisions of trains of whatever material rather than to rest content with steel cars to make collisions perfectly safe and customary."

The late President George F. Baer, of the Philadelphia & Reading, was widely reported to have made the following statement: "By discipline--firm, rigid, unyielding discipline--alone can railroad wrecks be averted. I do not believe in all-steel cars. I think the half-steel cars are the safest. But steel cars will not prevent wrecks. Discipline alone can do that."



The steel car thus far has shown itself to good advantage in wrecks. It may not necessarily prevent wrecks but it protects the lives of the passengers and employees in time of wreck. The Interstate Commerce Commission in expressing its view in regard to the replacement of wooden cars with steel cars stated: "Investigations of wrecks which we have conducted have impressed us strongly with the conviction that steel passenger train equipment affords better protection to passengers than has ever been afforded by any other equipment."

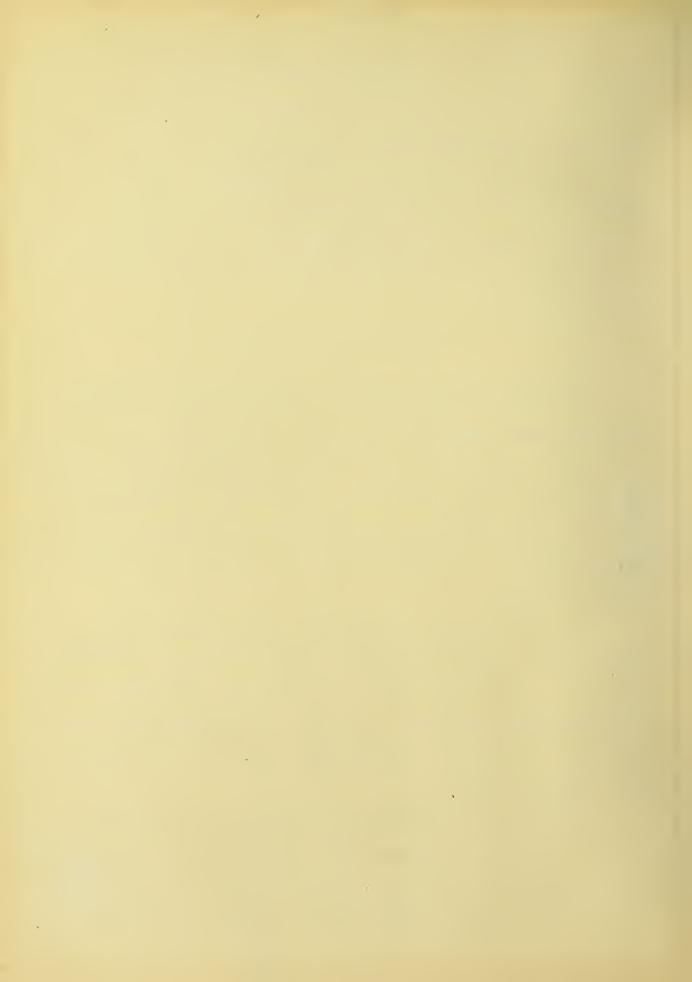
Safety First Movement.

The Safety First Movement is one of the best remedies which have been suggested or put into use for reducing accidents. The results so far obtained are very encouraging indeed. Although the movement is only just begun, the per cent of killed and injured has been reduced to a marked degree, as reported by the different Safety First Organizations of the various railroads throughout the country.

The Safety First Movement was first inauguarated by the United States Steel Corporation in May 1906 among its employees and later it was introduced on the railroads. The first attempt to improve the conditions in railroads was in 1906 when Mr. R.C. Richards introduced the Safety First Movement in the Chicago and North Western Railway.

The aims of the Safety First movement are threeford:

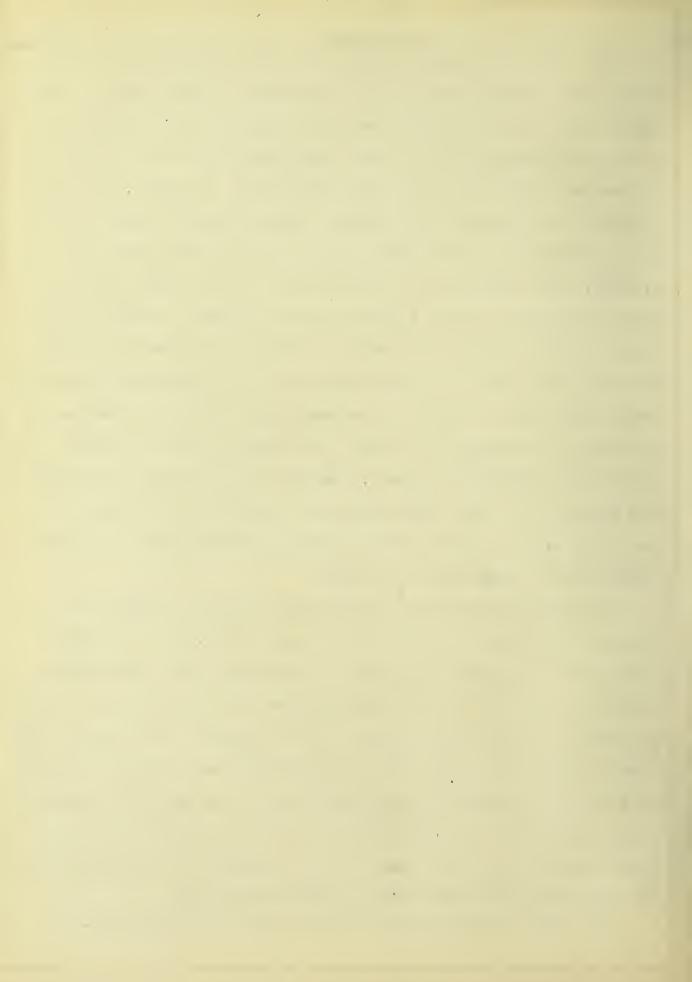
- (1) Improve and make safe defective or improper condition of way, structure, equipment, machinery, tools or applicances.
 - (2) Correct improper method of work or operation.



(3) Train and educate employees in all branches of the service to use necessary care in the discharge of their duties. With these ideas in view the employees are taught not to take chances in the performance of their work. They are taught that if such chances are taken, not only their own life is in danger, but the lives of other people are at stake. "Safety before Speed" is the motto of most of the railroads, if not all the railroads in the country. The enginemen are cautioned not to take risks when in doubt, and never to pass a danger signal at speed. Violations of this rule have caused many costly collisions. The men are taught how to do the work in the safest way, as it has been said that "No safety appliance is safe with an unsafe man." The railroad men are urged to study and to discuss the subject: "How to prevent accidents". wherever they meet, whether in their hotels and boarding houses or in their club rooms and lodge halls. New men, who are green in the service, are specially impressed with the supreme importance of doing the work safely.

The Safety First Movement has spread quickly through-out the country. Lectures are now given upon the subject in school rooms, churches, work shops, and in almost any other place where they will draw a crowd. The movement has become very effective in almost every railroad company in the country. The reports from these carriers show that there is a reduction of nearly 30 per cent in killed and injured in the short time that it has been advocated. When we realize that nearly 80 per cent of the killed and injured every year is due to the fault of the employees, the possibilities of the Safety First Movement are better understood.

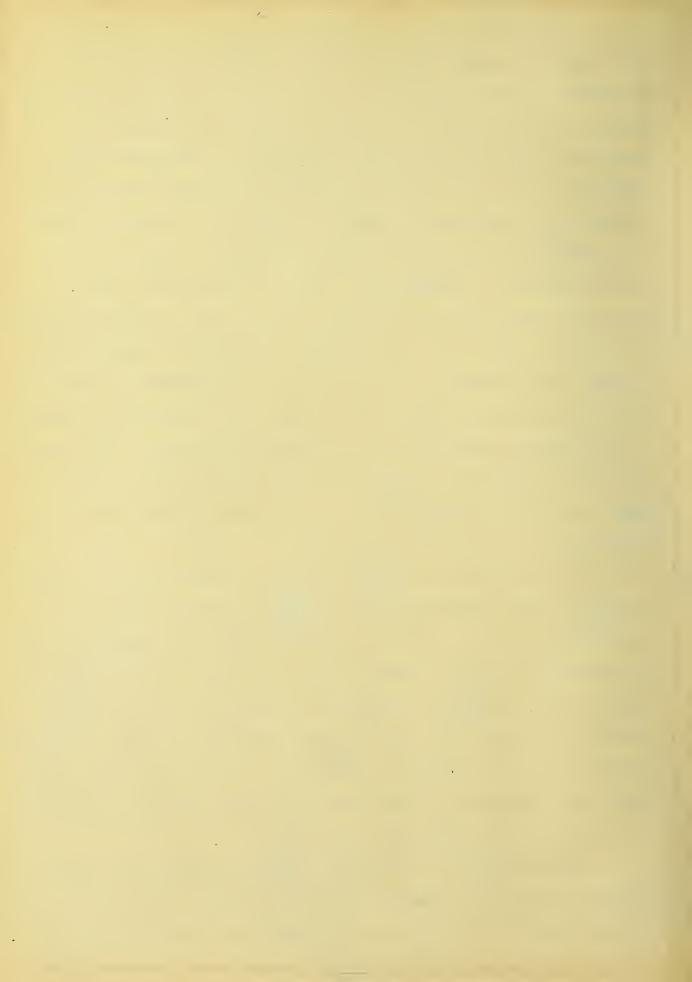
If there is 30 per cent reduction from the 80 per cent, we



still have a remainder of 50 per cent. Could this 50 per cent be reduced? What steps should be taken to reduce this 50 per cent? The only remedy immediately available seems to be discipline. According to the definition given by Webster, discipline means treatment suited to a disciple or learner; education; training; correction or chatisement. However, discipline as defined by Mr. W. L. Park, Vice-President and General Manager of the Illinois Central Railroad is as follows: "Certain well-defined rules, thoroughly understood by all alike, by those who use them and those who supervise their use. Intelligent and consistent supervision of those who are governed by the rules, ever vigilant to detect violations and apply corrective measures. The rules are provided in the standard code of American Railway Association. They are the results of experience and elimination covering the eighty years of our railway operation. They are comparatively simple, comprehensive and easy of compliance."

In complying to this definition the disciplining of enginemen is the most important problem. If the enginemen could be disciplined, most of the collisions and derailments could be easily avoided. It has been found by MR. W. L. Park that not one in a thousand enginemen can repeat even the definitions verbatim and scarcely a railway man in this country who knows the rules by heart. To remedy this the men must be educated. When the men have a good knowledge of the rules through education then a strict enforcement of the laws may be made.

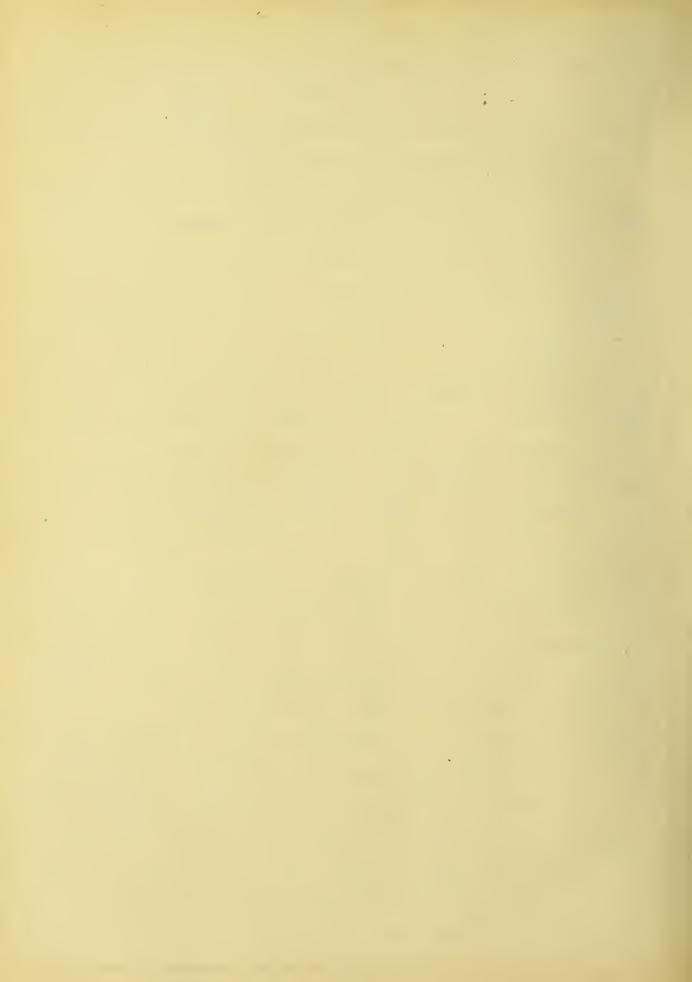
The efficiency of the enginemen can be raised to a higher standard by constant practice in surprise tests. These tests must be faithfully carried out by the officials and must be performed



with the seriousness of military precision. The test of the men must be actual, systematic and continuous along the line. It must be fair to the employees and the results must be understood by them as well as by the officials who make them.

Discipline can only be dealt with by the railway officers with the co-operation of the Brotherhood of Locomotive Engineers and other like railway lodges. The results could be obtained easier through the personal contact of the officials with the employees. The officials must take an interest in the employees' welfares, whether in the clubs, lodges or home affairs. A touch of good feeling among the employees will no doubt bring them into support of such a movement as the Safety First Movement. However, there is always room for some criticism on some one's part. It has been stated that railroad employees "kick" against discipline; they "kick" against merit and ability as a factor of promotion, and "kick" against what is, what is not and what is likely to be. It would be a hard task if the center of influence is passed into the hands of the union. They would strike when one of the members is discharged for want of discipline. This kind of action tends to make the manager of the railways helpless in enforcing obedience to rules and securing good work. Discipline could only be obtained through the Railway lodges' co-operation with the officials in weeding out the undesirable men in the service of the railway.

The problem of discipline has been solved splendidly in England and has proved to be a success for a great many years, as the reports of the Board of Trade show. It has been proved that discipline could be established and results could be obtained from the men if the railways really wish to have it. How does England



go about the solution of this problem?

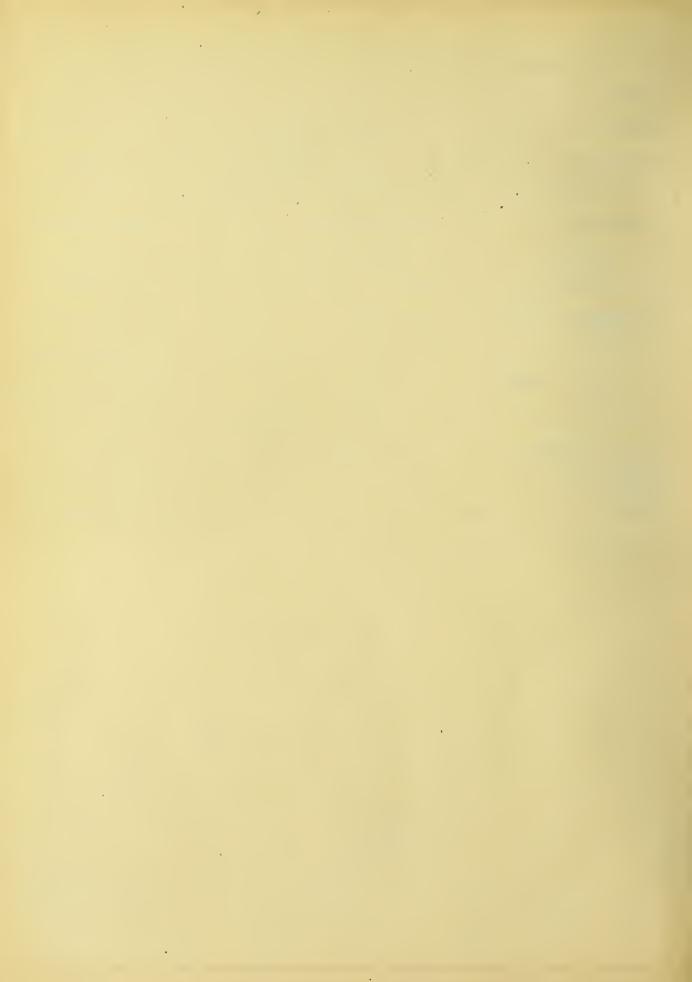
of course labor conditions in England are different from those in America, but there is no doubt that the mental capacities of the men are the same. In Great Britain when an engineer, or fireman, or who ever he may be, leaves a railway he is a marked man. He will have a hard time to secure a position with other railway companies. Consequently a railway employee in England values his job and takes care to keep it. The result is when he is in trouble his record will back him up. In America the condition is entirely discharged different. If a man is, from one railroad, he can soon get another berth on another road. The brotherhood lodges in England are able to suggest loop-holes in the trial of its members, and the companies sometimes help their employees in case of accidents provided that the employee's record is a good one.

It may be added that British law allows railway employees to be prosecuted for carelessness even when no accident occurs, if life was actually endangered. In all cases of sudden death, or of death from other than natural causes, they are investigated by the coroner for the district. Should a verdict, returned by the jury that is presiding over the case, that such death was due to the culpable negligence of any person, this would be equivalent to a verdict of manslaughter and the police would then take criminal proceedings. It has developed that in five out of ten criminal prosecutions the verdict is against the enginemen or fireman who is responsible for the accident.

The matter of good discipline is not only satisfactorily worked out in England, but it has been equally well established in most of the European Countries.

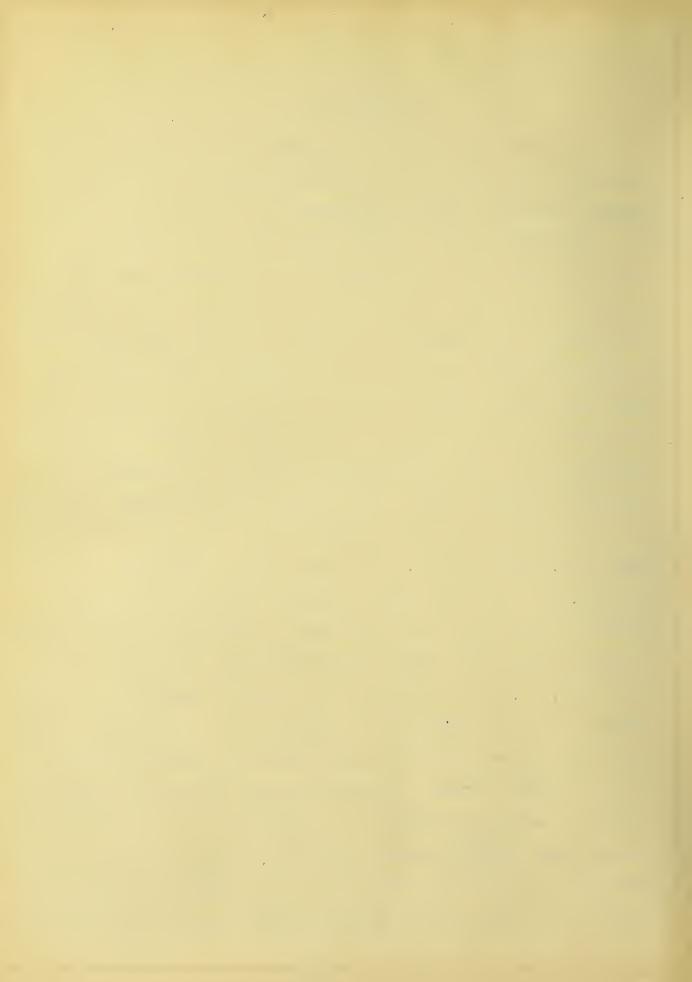


"Nothing is more essential to the safe and efficient operation of a railway than good discipline. To establish and maintain good discipline, it is necessary that the men affected should be properly instructed as to their duties and responsibilities", said Vice-President Daniel Willard of the Chicago, Burlington and Quincy Railroad. This statement seems to be true in many respects, as there are a good many examples from which it may be illustrated. The Pennsylvannia Lines, have during the past five or more years, have been practicing a high grade of discipline. The Company has established an educational system of discipline and it has proved to be very effective in reducing accidents. The Pennsylvannia Lines carried during the past five years 600,000,000 passengers and had only one accident, which took away 16 lives. "One accident is a little too much for our road" said an official of the Pennsylvannia Railroad, and so they are now using every precaution to prevent a recurrence of such an accident.



CONCLUSIONS.

In conclusion it must be admitted that the automatic block system has a great deal in its favor as a remedy in preventing accidents; although it must be accompanied by the most rigid discipline. The steel car has proved a good remedy in protecting the lives and limbs of the passengers in time of wrecks; full train crew bills have helped to move trains faster and safer; the Safety First Movement has decreased the number of killed and injured and has saved millions of dollars for the railways; and the various state and Federal laws have reduced the number of accidents and have increased the efficiency of the railway employees. Which of these movements offers the greatest assistance in permanently reducing the accident list? The figures already presented show that if the full-train crew bill is introduced it will cost the railways nearly \$20,000,000 yearly, or for ten years it will cost \$200,000,000. For steel cars to replace wooden cars will cost \$614,619,100 and will require at least ten years for its completion. To have all the roads install automatic block systems will cost about \$260,000,000 as estimated by the Special Committee on the Relation of Railway Operation to Legislation. It probably would take about ten years to install the automatic signals throughout all the railway systems. To have Government owernship in order to reduce the accidents is said to be impossible by the great English Railway Economist, Mr. Acworth, who said, "I cannot see that your scheme would work. It appears to me that an essential perequisite would be the repeal of all existing railway restrictive legislation

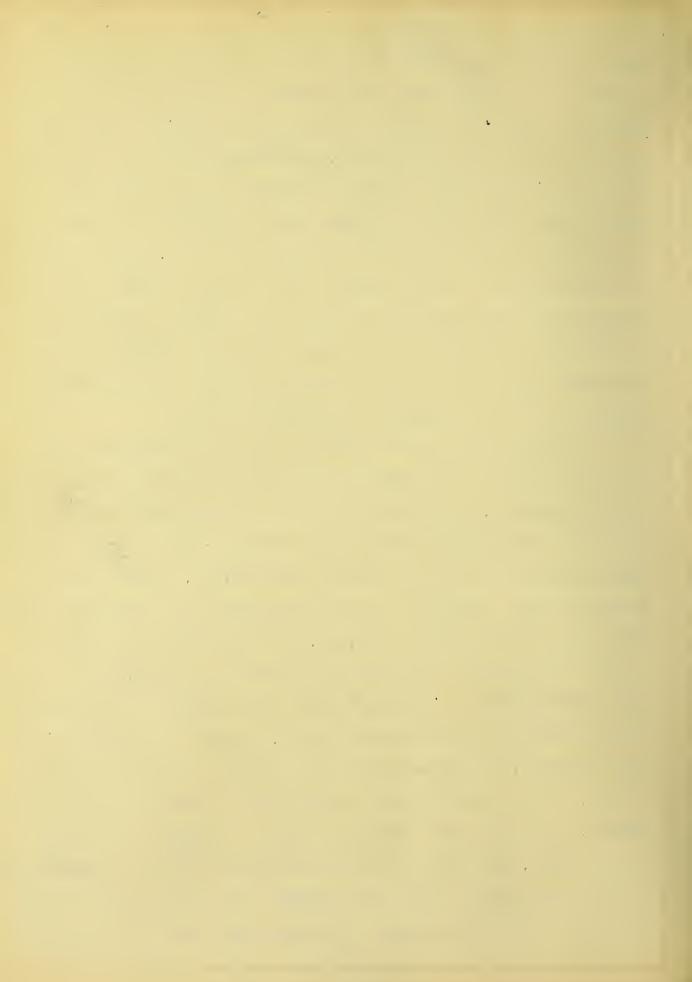


and the abolition of state and interstate commissions. This

I cannot imagine the public would stand". Another remedy has been suggested many times, that is, the reduction of speed. This again does not seem to meet with favor. As President Hadley of Yale has said, "I am afraid that neither the public nor the Government is awake to the real state of things. In our endeavors to control corporations we too often try to lessen their efficiency instead of increasing it. We are appalled by a railway accident, and we suggest that every engine should have two engineers instead of one. A fast train runs off the track and a government officer suggests the people ought not to want to travel so fast. If these views prevail, the days of America's greatness is done."

On the other hand the railways are paying out every year to injured persons about \$60,000,000 and if that ratio is prolonged for ten years, the railways will pay for accidents, \$600,000,000.

To establish the block system throught-out the entire rail-way mileage will cost the railways \$260,000,000, as has been previously stated. This could be accomplished by the following method. Let it be assumed that the \$20,000,000 which is paid for extra men on the full-crew bill be used as the interest on \$260,000,000. Then take \$20,000,000 off the \$60,000,000 which is paid to the injured, and as damages and for clearing wrecks, and use that amount to redeem the \$260,000,000 bonds which are issued to install the block system. We see that it will probably take 12 years to pay up this amount. In England the automatic system is compulsory on every railway line, and this is the reason why the railway operation there is much safer than in the United States. The figures above do not in any way impair the income of the railways, nor do they affect

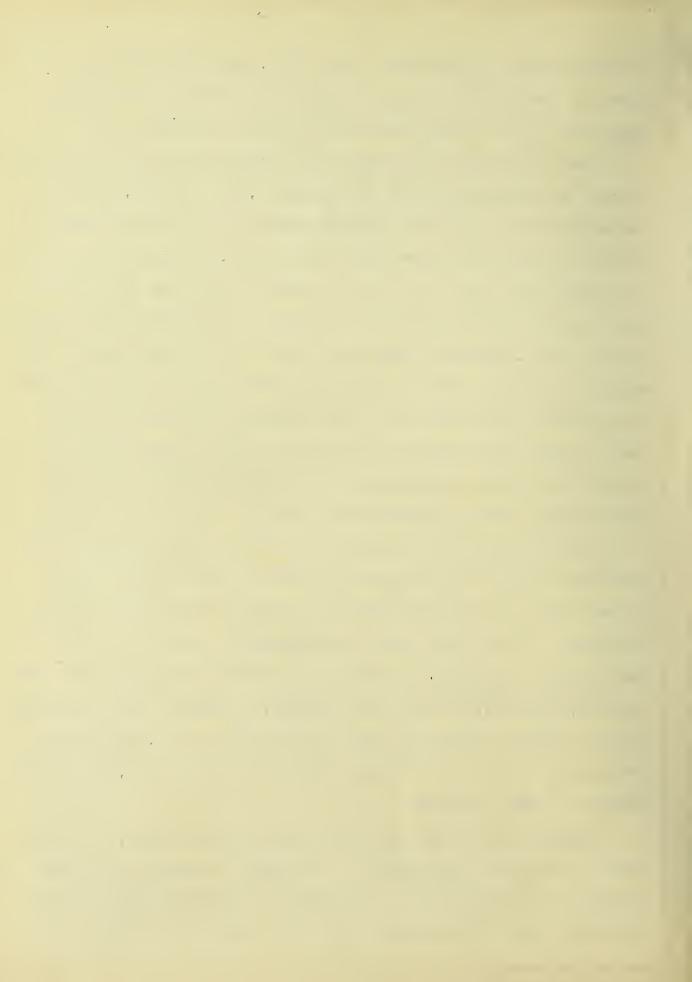


the net surplus of the roads. Therefore, the writer believes that a Federal law should be passed making the automatic block system compulsory on all roads which have not yet established it.

Steel cars could be manufactured to completely replace the wooden cars by expending some of the \$600,000,000. If \$30,000,000 of the amount which would have been expended on injured and damage of property be used every year for this purpose, which gives time for the wooden cars that are in use to wear down, we see that it will take about 20 years to make the change. This \$30,000,000 expended on cars would, however, impair the income of the railroads to some extent and it would only decrease the number of killed and injured in a comparatively small way. Nevertheless, to make travelling safer, steel cars should be used, and to get such cars Congress should enact a law compelling the adoption of steel cars on all the railways within a period of 20 years.

A National trespassing law is needed and Congress should take immediate action in this important matter. Every day it delays to pass such a law means a loss of 14 lives, which could easily be saved. It would not cost the government a penny to pass such a law, although its strict enforcement would be very expensive. The results, however, are worth the expense. A Federal law, if uniform and if strictly enforced, would save the lives of 5,200 persons every year. In ten years there would be an army of 52,000 men who might be useful citizens.

The Safety First Movement has been a grand success, but still there is room for improvement. It should be broadened out like the Society of Conservation of Forestry and Natural Resources in America. There are no greater resources than human beings. A



Nation's wealth is not only judged by its mineral resources, but by its human resources also. A society for the conservation of men should be formed to carry the campaign of Safety First in a more rigorous manner not only upon the railways but in all walks of every-day life. This is not a hard society to form and if such a step is taken the number of lives saved annually should soon be amazing.

replace the wooden ones, a national trespassing law enacted and other effective remedies adopted as already pointed out, including a more comprehensive Safety First Movement, 53% of all the deaths due to trespassing, 62% of all collisions and derailments and 87.7% of all the railroad accidents, would be averted. If all these remedies were applied, America could not only be proud of her perfect mechanical devices but proud of the safety record with which all of her main railway trains were operated.





